# SYO axioms
# SYO problems

**SYO001∧1.p** Leibniz equality is transitive
leibeq: $i → $i → $o  thf(leibeq_decl, type)
leibeq = (λ$x: $i, $y: $i: ∀$p: $i → $o: (($p@$x) ⇒ ($p@$y)))  thf(leibeq, definition)
∀$x: $i, $y: $i, $z: $i: ((leibeq@$x@$y and leibeq@$y@$z) ⇒ (leibeq@$x@$z))  thf(conj, conjecture)

**SYO002∧1.p** Leibniz equality obeys the congruence property under functions
leibeq: $i → $i → $o  thf(leibeq_decl, type)
leibeq = (λ$x: $i, $y: $i: ∀$p: $i → $o: (($p@$x) ⇒ ($p@$y)))  thf(leibeq, definition)
∀$x: $i, $y: $i, $f: $i → $i: ((leibeq@$x@$y) ⇒ (leibeq@($f@$x)@($f@$y)))  thf(conj, conjecture)

**SYO003∧1.p** Leibniz equality obeys the congruence property under predicates
leibeq: $i → $i → $o  thf(leibeq_decl, type)
leibeq = (λ$x: $i, $y: $i: ∀$p: $i → $o: (($p@$x) ⇒ ($p@$y)))  thf(leibeq, definition)
∀$x: $i, $y: $i, $p: $i → $o: ((leibeq@$x@$y and $p@$x) ⇒ ($p@$y))  thf(conj, conjecture)

**SYO004∧1.p** Relating Leibniz equality to primitive equality
leibeq: $i → $i → $o  thf(leibeq_decl, type)
leibeq = (λ$x: $i, $y: $i: ∀$p: $i → $o: (($p@$x) ⇒ ($p@$y)))  thf(leibeq, definition)
∀$x: $i, $y: $i: ((leibeq@$x@$y) ⇒ $x = $y)  thf(conj, conjecture)

**SYO005∧1.p** The trivial direction of functional extensionality
$\text{leibeq}_1$: $i → $i → $o  thf(leibeq1_type, type)
$\text{leibeq}_1$ = (λ$u: $i, $v: $i: ∀$q: $i → $o: (($q@$u) ⇒ ($q@$v)))  thf($\text{leibeq}_1$, definition)
$\text{leibeq}_2$: ($i → $i) → ($i → $i) → $o  thf(leibeq2_type, type)
$\text{leibeq}_2$ = (λ$x: $i → $i, $y: $i → $i: ∀$p: ($i → $i) → $o: (($p@$x) ⇒ ($p@$y)))  thf($\text{leibeq}_2$, definition)
∀$f: $i → $i, $g: $i → $i: (($\text{leibeq}_2$@$f@$g) ⇒ ∀$x: $i: ($\text{leibeq}_1$@($f@$x)@($g@$x)))  thf(conj, conjecture)

**SYO006∧1.p** The trivial direction of Boolean extensionality
leibeq: $o → $o → $o  thf(leibeq1_type, type)
leibeq = (λ$u: $o, $v: $o: ∀$q: $o → $o: (($q@$u) ⇒ ($q@$v)))  thf($\text{leibeq}_1$, definition)
∀$a: $o, $b: $o: ((leibeq@$a@$b) ⇒ ($a ⟺ $b))  thf(conj, conjecture)

**SYO007∧1.p** The non-trivial direction of Boolean extensionality
leibeq: $o → $o → $o  thf(leibeq1_type, type)
leibeq = (λ$u: $o, $v: $o: ∀$q: $o → $o: (($q@$u) ⇒ ($q@$v)))  thf($\text{leibeq}_1$, definition)
∀$a: $o, $b: $o: (($a ⟺ $b) ⇒ (leibeq@$a@$b))  thf(conj, conjecture)

**SYO008∧1.p** The non-trivial direction of functional extensionality
$\text{leibeq}_1$: $i → $i → $o  thf(leibeq1_type, type)
$\text{leibeq}_1$ = (λ$u: $i, $v: $i: ∀$q: $i → $o: (($q@$u) ⇒ ($q@$v)))  thf($\text{leibeq}_1$, definition)
$\text{leibeq}_2$: ($i → $i) → ($i → $i) → $o  thf(leibeq2_type, type)
$\text{leibeq}_2$ = (λ$x: $i → $i, $y: $i → $i: ∀$p: ($i → $i) → $o: (($p@$x) ⇒ ($p@$y)))  thf($\text{leibeq}_2$, definition)
∀$f: $i → $i, $g: $i → $i: (∀$x: $i: ($\text{leibeq}_1$@($f@$x)@($g@$x)) ⇒ ($\text{leibeq}_2$@$f@$g))  thf(conj, conjecture)

**SYO009∧1.p** Eta-equality using Leibniz equality
$p: ($i → $i) → $o  thf($p, type)
$f: $i → $i  thf($f, type)
($p@λ$x: $i: ($f@$x)) ⇒ ($p@$f)  thf(conj, conjecture)

**SYO010∧1.p** Something requiring Xi but not Eta
leibeq: $i → $i → $o  thf(leibeq_type, type)
leibeq = (λ$u: $i, $v: $i: ∀$q: $i → $o: (($q@$u) ⇒ ($q@$v)))  thf(leibeq, definition)
$p: ($i → $i) → $o  thf(p_type, type)
$f: $i → $i  thf(f_type, type)
(∀$x: $i: (leibeq@($f@$x)@$x) and $p@λ$x: $i: $x) ⇒ ($p@λ$x: $i: ($f@$x))  thf(conj, conjecture)

**SYO011∧1.p** Invalid formula in model classes not requiring f
leibeq: $i → $i → $o  thf(leibeq_type, type)
leibeq = (λ$u: $i, $v: $i: ∀$q: $i → $o: (($q@$u) ⇒ ($q@$v)))  thf(leibeq, definition)
$p: ($i → $i) → $o  thf(p_type, type)
$f: $i → $i  thf(f_type, type)

$(\forall x$: \$i: (leibeq@$(f@x)@x)$ and $p@\lambda x$: \$i: $x) \Rightarrow (p@f)$ thf(conj, conjecture)

**SYO012^1.p** Formula valid with Boolean extentionality 1
$a$: \$o thf($a$, type)
$b$: \$o thf($b$, type)
$p$: \$o → \$o thf($p$, type)
$(p@(a$ and $b)) \Rightarrow (p@(b$ and $a))$ thf(conj, conjecture)

**SYO013^1.p** Formula valid with Boolean extentionality 2
$a$: \$o thf(a_type, type)
$b$: \$o thf(b_type, type)
$p$: \$o → \$o thf(p_type, type)
$(a$ and $b$ and $p@a) \Rightarrow (p@b)$ thf(conj, conjecture)

**SYO015^1.p** A is not equal to not A
$a$: \$o thf($a$, type)
$a \neq \neg\, a$ thf(conj, conjecture)

**SYO016^1.p** Formula valid in MBb, but not in model classes not requiring b
leibeq: \$o → \$o → \$o thf(leibeq_decl, type)
leibeq = $(\lambda x$: \$o, $y$: \$o: $\forall p$: \$o → \$o: $((p@x) \Rightarrow (p@y)))$ thf(leibeq, definition)
$h$: \$o → \$o thf($h$, type)
leibeq@($h$@(leibeq@($h$@\$true)@($h$@\$false)))@($h$@\$false) thf(conj, conjecture)

**SYO017^1.p** Formula valid in MBb, but not in model classes not requiring b
$h$: \$o → \$o thf($h$, type)
$(h@(h@\$true) = (h@\$false)) = (h@\$false)$ thf(conj, conjecture)

**SYO018^1.p** Formula requiring b and Eta
$f$: \$o → \$i → \$i thf($f$, type)
$p$: (\$i → \$i) → \$o thf($p$, type)
$a$: (\$i → \$i) → \$o thf($a$, type)
$b$: \$o thf($b$, type)
$(p@\lambda x$: \$i: $(f@(a@\lambda x$: \$i: $(f@b@x)$ and $b)@x)) \Rightarrow (p@(f@(b$ and $a@(f@b))))$ thf(conj, conjecture)

**SYO019^1.p** De Morgan by equivalance
$\forall x$: \$o, $y$: \$o: $((x$ and $y) \iff \neg\, \neg\, x$ or $\neg\, y)$ thf(conj, conjecture)

**SYO020^1.p** De Morgan by Leibnitz
leibeq: \$o → \$o → \$o thf(leibeq_decl, type)
leibeq = $(\lambda x$: \$o, $y$: \$o: $\forall p$: \$o → \$o: $((p@x) \Rightarrow (p@y)))$ thf(leibeq, definition)
$\forall x$: \$o, $y$: \$o: (leibeq@$(x$ and $y)@\neg\, \neg\, x$ or $\neg\, y)$ thf(conj, conjecture)

**SYO021^1.p** De Morgan by equality
$\forall x$: \$o, $y$: \$o: $(x$ and $y) = \neg\, \neg\, x$ or $\neg\, y$ thf(conj, conjecture)

**SYO022^1.p** De Morgan lambda terms by Leibnitz
leibeq: (\$o → \$o → \$o) → (\$o → \$o → \$o) → \$o thf(leibeq_decl, type)
leibeq = $(\lambda x$: \$o → \$o → \$o, $y$: \$o → \$o → \$o: $\forall p$: (\$o → \$o → \$o) → \$o: $((p@x) \Rightarrow (p@y)))$ thf(leibeq, definition)
leibeq@$\lambda u$: \$o, $v$: \$o: $(u$ and $v)@\lambda x$: \$o, $y$: \$o: $\neg\, \neg\, x$ or $\neg\, y$ thf(conj, conjecture)

**SYO023^1.p** De Morgan lambda terms by Leibnitz
$(\lambda u$: \$o, $v$: \$o: $(u$ and $v)) = (\lambda x$: \$o, $y$: \$o: $\neg\, \neg\, x$ or $\neg\, y)$ thf(conj, conjecture)

**SYO024^1.p** De Morgan by connectives and Leibnitz
leibeq: (\$o → \$o → \$o) → (\$o → \$o → \$o) → \$o thf(leibeq_decl, type)
leibeq = $(\lambda x$: \$o → \$o → \$o, $y$: \$o → \$o → \$o: $\forall p$: (\$o → \$o → \$o) → \$o: $((p@x) \Rightarrow (p@y)))$ thf(leibeq, definition)
leibeq@and@$\lambda x$: \$o, $y$: \$o: $\neg\, \neg\, x$ or $\neg\, y$ thf(conj, conjecture)

**SYO025^1.p** De Morgan by connectives and equality
and = $(\lambda x$: \$o, $y$: \$o: $\neg\, \neg\, x$ or $\neg\, y)$ thf(conj, conjecture)

**SYO026^1.p** Four functions from truth values to truth values
In Henkin semantics there are exactly four functions from truth values to truth values.
$p$: (\$o → \$o) → \$o thf(p_decl, type)
$(p@\lambda x$: \$o: $x$ and $p@\lambda x$: \$o: $\neg\, x$ and $p@\lambda x$: \$o: \$false and $p@\lambda x$: \$o: \$true$) \Rightarrow \forall y$: \$o → \$o: $(p@y)$ thf(conj, conjecture)

**SYO027^1.p** Something is true
$\exists p$: \$o: $p$ thf(conj, conjecture)

**SYO028^1.p** Not all things are false
$\neg\, \forall p\colon \$o\colon p$ thf(conj, conjecture)

**SYO029^1.p** There is an identity unary connective
$\exists n\colon \$o \to \$o\colon \forall p\colon \$o\colon ((n@p) \iff \neg\, p)$ thf(conj, conjecture)

**SYO030^1.p** Not every unary connective is the identity
leibeq: $\$o \to \$o \to \$o$ thf(leibeq_decl, type)
$\text{leibeq} = (\lambda x\colon \$o, y\colon \$o\colon \forall p\colon \$o \to \$o\colon ((p@x) \Rightarrow (p@y)))$ thf(leibeq, definition)
$\neg\, \forall f\colon \$o \to \$o\colon \exists x\colon \$o\colon (\text{leibeq}@(f@x)@x)$ thf(conj, conjecture)

**SYO031^1.p** Not every unary connective is the identity
$\neg\, \forall f\colon \$o \to \$o\colon \exists x\colon \$o\colon (f@x) = x$ thf(conj, conjecture)

**SYO032^1.p** There is a disjunction connective
$\exists d\colon \$o \to \$o \to \$o\colon \forall p\colon \$o, q\colon \$o\colon ((d@p@q) \iff (p \text{ or } q))$ thf(conj, conjecture)

**SYO033^1.p** There is a universal quantifer
$\exists q\colon (\$i \to \$o) \to \$o\colon \forall p\colon \$i \to \$o\colon ((q@p) \iff \forall x\colon \$i\colon (p@x))$ thf(conj, conjecture)

**SYO034^1.p** Formula not making use of projection
$\exists n\colon \$o \to \$o\colon \forall p\colon \$o\colon ((n@p) \iff p)$ thf(conj, conjecture)

**SYO035^1.p** Higher-order unification does not always provide projection terms
$\text{leibeq}_1\colon \$i \to \$i \to \$o$ thf(leibeq1_type, type)
$\text{leibeq}_1 = (\lambda x\colon \$i, y\colon \$i\colon \forall p\colon \$i \to \$o\colon ((p@x) \Rightarrow (p@y)))$ thf($\text{leibeq}_1$, definition)
$\text{leibeq}_2\colon (\$i \to \$o) \to (\$i \to \$o) \to \$o$ thf(leibeq2_type, type)
$\text{leibeq}_2 = (\lambda x\colon \$i \to \$o, y\colon \$i \to \$o\colon \forall p\colon (\$i \to \$o) \to \$o\colon ((p@x) \Rightarrow (p@y)))$ thf($\text{leibeq}_2$, definition)
$\forall x\colon \$i, y\colon \$i\colon ((\text{leibeq}_2@\lambda z\colon \$i\colon z = x@\lambda z\colon \$i\colon z = y) \Rightarrow (\text{leibeq}_1@x@y))$ thf(conj, conjecture)

**SYO037^1.p** Injective Cantor theorem
$\neg\, \exists h\colon (\$i \to \$o) \to \$i\colon \forall p\colon \$i \to \$o, q\colon \$i \to \$o\colon ((h@p) = (h@q) \Rightarrow p = q)$ thf(conj, conjecture)

**SYO038-1.002.304.p** Boolos' Curious Inference, size f(2,f(3,4))
$f(n, 1) = s(1)$ cnf($\text{ax}_1$, axiom)
$f(1, s(x)) = s(s(f(1, x)))$ cnf($\text{ax}_2$, axiom)
$f(s(n), s(x)) = f(n, f(s(n), x))$ cnf($\text{ax}_3$, axiom)
$d(1)$ cnf($\text{ax}_4$, axiom)
$d(x) \Rightarrow d(s(x))$ cnf($\text{ax}_5$, axiom)
$\neg\, d(f(s(1), f(s(s(1)), s(s(s(1))))))$ cnf(conj, negated_conjecture)

**SYO038-1.003.003.p** Boolos' Curious Inference, size f(3,3)
$f(n, 1) = s(1)$ cnf($\text{ax}_1$, axiom)
$f(1, s(x)) = s(s(f(1, x)))$ cnf($\text{ax}_2$, axiom)
$f(s(n), s(x)) = f(n, f(s(n), x))$ cnf($\text{ax}_3$, axiom)
$d(1)$ cnf($\text{ax}_4$, axiom)
$d(x) \Rightarrow d(s(x))$ cnf($\text{ax}_5$, axiom)
$\neg\, d(f(s(s(1)), s(s(1))))$ cnf(conj, negated_conjecture)

**SYO038-1.003.004.p** Boolos' Curious Inference, size f(3,4)
$f(n, 1) = s(1)$ cnf($\text{ax}_1$, axiom)
$f(1, s(x)) = s(s(f(1, x)))$ cnf($\text{ax}_2$, axiom)
$f(s(n), s(x)) = f(n, f(s(n), x))$ cnf($\text{ax}_3$, axiom)
$d(1)$ cnf($\text{ax}_4$, axiom)
$d(x) \Rightarrow d(s(x))$ cnf($\text{ax}_5$, axiom)
$\neg\, d(f(s(s(1)), s(s(s(1)))))$ cnf(conj, negated_conjecture)

**SYO038-1.004.004.p** Boolos' Curious Inference, size f(4,4)
$f(n, 1) = s(1)$ cnf($\text{ax}_1$, axiom)
$f(1, s(x)) = s(s(f(1, x)))$ cnf($\text{ax}_2$, axiom)
$f(s(n), s(x)) = f(n, f(s(n), x))$ cnf($\text{ax}_3$, axiom)
$d(1)$ cnf($\text{ax}_4$, axiom)
$d(x) \Rightarrow d(s(x))$ cnf($\text{ax}_5$, axiom)
$\neg\, d(f(s(s(s(1))), s(s(s(1)))))$ cnf(conj, negated_conjecture)

**SYO038-1.005.005.p** Boolos' Curious Inference, size f(5,5)
$f(n, 1) = s(1)$ cnf($\text{ax}_1$, axiom)

$f(1, s(x)) = s(s(f(1, x)))$ cnf($\text{ax}_2$, axiom)
$f(s(n), s(x)) = f(n, f(s(n), x))$ cnf($\text{ax}_3$, axiom)
$d(1)$ cnf($\text{ax}_4$, axiom)
$d(x) \Rightarrow d(s(x))$ cnf($\text{ax}_5$, axiom)
$\neg\, d(f(s(s(s(s(1)))), s(s(s(s(1))))))$ cnf(conj, negated_conjecture)

**SYO038^1.002.304.p** Boolos' Curious Inference, size f(2,f(3,4))
1: \$i thf(one, type)
$s$: \$i → \$i thf($s$, type)
$f$: \$i → \$i → \$i thf($f$, type)
$d$: \$i → \$o thf($d$, type)
$\forall n$: \$i: $(f@n@1) = (s@1)$ thf($\text{ax}_1$, axiom)
$\forall x$: \$i: $(f@1@(s@x)) = (s@(s@(f@1@x)))$ thf($\text{ax}_2$, axiom)
$\forall n$: \$i, $x$: \$i: $(f@(s@n)@(s@x)) = (f@n@(f@(s@n)@x))$ thf($\text{ax}_3$, axiom)
$d@1$ thf($\text{ax}_4$, axiom)
$\forall x$: \$i: $((d@x) \Rightarrow (d@(s@x)))$ thf($\text{ax}_5$, axiom)
$d@(f@(s@1)@(f@(s@(s@1))@(s@(s@(s@1)))))$ thf(conj, conjecture)

**SYO038^1.003.003.p** Boolos' Curious Inference, size f(3,3)
1: \$i thf(one, type)
$s$: \$i → \$i thf($s$, type)
$f$: \$i → \$i → \$i thf($f$, type)
$d$: \$i → \$o thf($d$, type)
$\forall n$: \$i: $(f@n@1) = (s@1)$ thf($\text{ax}_1$, axiom)
$\forall x$: \$i: $(f@1@(s@x)) = (s@(s@(f@1@x)))$ thf($\text{ax}_2$, axiom)
$\forall n$: \$i, $x$: \$i: $(f@(s@n)@(s@x)) = (f@n@(f@(s@n)@x))$ thf($\text{ax}_3$, axiom)
$d@1$ thf($\text{ax}_4$, axiom)
$\forall x$: \$i: $((d@x) \Rightarrow (d@(s@x)))$ thf($\text{ax}_5$, axiom)
$d@(f@(s@(s@1))@(s@(s@1)))$ thf(conj, conjecture)

**SYO038^1.003.004.p** Boolos' Curious Inference, size f(3,4)
1: \$i thf(one, type)
$s$: \$i → \$i thf($s$, type)
$f$: \$i → \$i → \$i thf($f$, type)
$d$: \$i → \$o thf($d$, type)
$\forall n$: \$i: $(f@n@1) = (s@1)$ thf($\text{ax}_1$, axiom)
$\forall x$: \$i: $(f@1@(s@x)) = (s@(s@(f@1@x)))$ thf($\text{ax}_2$, axiom)
$\forall n$: \$i, $x$: \$i: $(f@(s@n)@(s@x)) = (f@n@(f@(s@n)@x))$ thf($\text{ax}_3$, axiom)
$d@1$ thf($\text{ax}_4$, axiom)
$\forall x$: \$i: $((d@x) \Rightarrow (d@(s@x)))$ thf($\text{ax}_5$, axiom)
$d@(f@(s@(s@1))@(s@(s@(s@1))))$ thf(conj, conjecture)

**SYO038^1.004.004.p** Boolos' Curious Inference, size f(4,4)
1: \$i thf(one, type)
$s$: \$i → \$i thf($s$, type)
$f$: \$i → \$i → \$i thf($f$, type)
$d$: \$i → \$o thf($d$, type)
$\forall n$: \$i: $(f@n@1) = (s@1)$ thf($\text{ax}_1$, axiom)
$\forall x$: \$i: $(f@1@(s@x)) = (s@(s@(f@1@x)))$ thf($\text{ax}_2$, axiom)
$\forall n$: \$i, $x$: \$i: $(f@(s@n)@(s@x)) = (f@n@(f@(s@n)@x))$ thf($\text{ax}_3$, axiom)
$d@1$ thf($\text{ax}_4$, axiom)
$\forall x$: \$i: $((d@x) \Rightarrow (d@(s@x)))$ thf($\text{ax}_5$, axiom)
$d@(f@(s@(s@(s@1)))@(s@(s@(s@1))))$ thf(conj, conjecture)

**SYO038^1.005.005.p** Boolos' Curious Inference, size f(5,5)
1: \$i thf(one, type)
$s$: \$i → \$i thf($s$, type)
$f$: \$i → \$i → \$i thf($f$, type)
$d$: \$i → \$o thf($d$, type)
$\forall n$: \$i: $(f@n@1) = (s@1)$ thf($\text{ax}_1$, axiom)
$\forall x$: \$i: $(f@1@(s@x)) = (s@(s@(f@1@x)))$ thf($\text{ax}_2$, axiom)
$\forall n$: \$i, $x$: \$i: $(f@(s@n)@(s@x)) = (f@n@(f@(s@n)@x))$ thf($\text{ax}_3$, axiom)

$d@1$ thf($\text{ax}_4$, axiom)
$\forall x$: \$i: $((d@x) \Rightarrow (d@(s@x)))$ thf($\text{ax}_5$, axiom)
$d@(f@(s@(s@(s@(s@1)))))@(s@(s@(s@(s@1)))))$ thf(conj, conjecture)

**SYO039∧1.p** Unsatisfiable basic formula 1
$h$: \$o → \$i thf($h$, type)
$(h@(h@\$\text{false}) = (h@\neg\ \$\text{false})) \neq (h@\$\text{false})$ thf(1, axiom)

**SYO039∧2.p** Unsatisfiable basic formula 1
$h$: \$o → \$i thf($h$, type)
$(h@(h@\$\text{false}) = (h@\neg\ \$\text{false})) = (h@\$\text{false})$ thf(1, conjecture)

**SYO040∧1.p** Unsatisfiable basic formula 2
$f$: \$o → \$o thf($f$, type)
$h$: \$o → \$i thf($h$, type)
$x$: \$o thf($x$, type)
$(h@(f@(f@(f@x)))) \neq (h@(f@x))$ thf(2, axiom)

**SYO040∧2.p** Unsatisfiable basic formula 2
Variant of the Kaminski equation.
$f$: \$o → \$o thf($f$, type)
$h$: \$o → \$i thf($h$, type)
$x$: \$o thf($x$, type)
$(h@(f@(f@(f@x)))) = (h@(f@x))$ thf(2, conjecture)

**SYO041∧1.p** Unsatisfiable basic formula 3
$a$: \$o thf($a$, type)
$f$: \$o → \$o thf($f$, type)
$g$: \$o → \$o thf($g$, type)
$x$: \$o thf($x$, type)
$y$: \$o thf($y$, type)
$x \neq y$ and $(g@x) = y$ and $(g@y) = x$ and $(f@(f@(f@x))) = (g@(f@x))$ thf(3, axiom)

**SYO041∧2.p** Unsatisfiable basic formula 3
Variant of the Kaminski equation.
$a$: \$o thf($a$, type)
$f$: \$o → \$o thf($f$, type)
$g$: \$o → \$o thf($g$, type)
$x$: \$o thf($x$, type)
$y$: \$o thf($y$, type)
$\neg\ x \neq y$ and $(g@x) = y$ and $(g@y) = x$ and $(f@(f@(f@x))) = (g@(f@x))$ thf(3, conjecture)

**SYO042∧1.p** Unsatisfiable basic formula 4
$g$: \$o → \$o thf($g$, type)
$p$: (\$o → \$o) → \$o thf($p$, type)
$x$: \$o thf($x$, type)
$y$: \$o thf($y$, type)
$x \neq y$ and $(g@x) = y$ and $(g@y) = x$ and $p@g$ and $\neg\ p@\neg$ thf(4, axiom)

**SYO042∧2.p** Unsatisfiable basic formula 4
Negation is the unique function g such that g x = y and g y = x for x,y:o distinct.
$g$: \$o → \$o thf($g$, type)
$p$: (\$o → \$o) → \$o thf($p$, type)
$x$: \$o thf($x$, type)
$y$: \$o thf($y$, type)
$\neg\ x \neq y$ and $(g@x) = y$ and $(g@y) = x$ and $p@g$ and $\neg\ p@\neg$ thf(4, conjecture)

**SYO043∧1.p** Unsatisfiable basic formula 5
$f$: \$o → \$o thf($f$, type)
$q$: (\$o → \$o) → \$o → \$o thf($q$, type)
$x$: \$o thf($x$, type)
$q@f@x$ and $f@(f@x)$ and $(f@(q@f@x)) \neq (f@x)$ thf(5, axiom)

**SYO043∧2.p** Unsatisfiable basic formula 5
Variant of the Kaminski equation.

$f$: $\$o \to \$o$ thf($f$, type)
$q$: $(\$o \to \$o) \to \$o \to \$o$ thf($q$, type)
$x$: $\$o$ thf($x$, type)
$q@f@x$ and $f@(f@x)$ and $(f@(q@f@x)) = (f@x)$ thf(5, conjecture)

**SYO044^1.p** Simple textbook example 1
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mbox@$r$@mtrue)) thf(conj, conjecture)

**SYO045^1.p** Simple textbook example 2
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mimplies@(mbox@$r$@(mimplies@$a$@$b$))@

**SYO046^1.p** Simple textbook example 3
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mimplies@(mdia@$r$@(mimplies@$a$@$b$))@(

**SYO047^1.p** Simple textbook example 4
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mimplies@(mbox@$r$@(mimplies@$a$@$b$))@

**SYO048^1.p** Simple textbook example 5
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mequiv@(mbox@$r$@(mand@$a$@$b$))@(man

**SYO049^1.p** Simple textbook example 6
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mequiv@(mdia@$r$@(mor@$a$@$b$))@(mor@(

**SYO050^1.p** Simple textbook example 7
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mimplies@(mbox@$r$@$a$)@$a$))) thf(conj, conjecture)

**SYO050^2.p** Simple textbook example 7
include('Axioms/LCL013^0.ax')
$\exists r$: $\$i \to \$i \to \$o$: $\neg$ mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mimplies@(mbox@$r$@$a$)@$a$)) thf(conj, conjecture)

**SYO051^1.p** Simple textbook example 8
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mimplies@(mbox@$r$@$a$)@(mbox@$r$@(mbox@$r$@$a$))))) thf(conj, co

**SYO051^2.p** Simple textbook example 8
include('Axioms/LCL013^0.ax')
$\exists r$: $\$i \to \$i \to \$o$: $\neg$ mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mimplies@(mbox@$r$@$a$)@(mbox@$r$@(mbox@$r$@$a$)))) thf(con, co

**SYO052^1.p** Simple textbook example 9
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mimplies@(mbox@$r$@(mimplies@$a$@$b$))@

**SYO052^2.p** Simple textbook example 9
include('Axioms/LCL013^0.ax')
$r$: $\$i \to \$i \to \$o$ thf($r$, type)
$a$: $\$i \to \$o$ thf($a$, type)
$b$: $\$i \to \$o$ thf($b$, type)
$\exists r$: $\$i \to \$i \to \$o$: $\neg$ mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mforall_prop@$\lambda b$: $\$i \to \$o$: (mimplies@(mbox@$r$@(mimplies@$a$@$b$))@

**SYO053^1.p** Simple textbook example 10
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mdia@$r$@mtrue)) thf(conj, conjecture)

**SYO053^2.p** Simple textbook example 10
include('Axioms/LCL013^0.ax')
$\exists r$: $\$i \to \$i \to \$o$: $\neg$ mvalid@(mdia@$r$@mtrue) thf(conj, conjecture)

**SYO054^1.p** Simple textbook example 11
include('Axioms/LCL013^0.ax')
$\forall r$: $\$i \to \$i \to \$o$: (mvalid@(mforall_prop@$\lambda a$: $\$i \to \$o$: (mimplies@(mdia@$r$@$a$)@(mbox@$r$@$a$)))) thf(conj, conjecture)

**SYO054^2.p** Simple textbook example 11

include('Axioms/LCL013^0.ax')
$\exists r$: $i → $i → $o: ¬ mvalid@(mforall_prop@λa: $i → $o: (mimplies@(mdia@r@a)@(mbox@r@a)))  thf(conj, conjecture)

**SYO055^1.p** Simple textbook example 12
include('Axioms/LCL013^0.ax')
$\forall r$: $i → $i → $o: (mvalid@(mforall_prop@λa: $i → $o: (mforall_prop@λb: $i → $o: (mor@(mbox@r@(mimplies@(mbox@r@a

**SYO055^2.p** Simple textbook example 12
include('Axioms/LCL013^0.ax')
$\exists r$: $i → $i → $o: ¬ mvalid@(mforall_prop@λa: $i → $o: (mforall_prop@λb: $i → $o: (mor@(mbox@r@(mimplies@(mbox@r@a

**SYO056^1.p** Simple textbook example 13
include('Axioms/LCL013^0.ax')
$\forall r$: $i → $i → $o: (mvalid@(mforall_prop@λa: $i → $o: (mforall_prop@λb: $i → $o: (mimplies@(mbox@r@(mor@a@b))@(mor

**SYO056^2.p** Simple textbook example 13
include('Axioms/LCL013^0.ax')
$\exists r$: $i → $i → $o: ¬ mvalid@(mforall_prop@λa: $i → $o: (mforall_prop@λb: $i → $o: (mimplies@(mbox@r@(mor@a@b))@(mo

**SYO057^1.p** Simple textbook example 14
include('Axioms/LCL013^0.ax')
$\forall r$: $i → $i → $o: (mvalid@(mforall_prop@λa: $i → $o: (mimplies@(mbox@r@(mimplies@(mbox@r@a)@a))@(mbox@r@a)))

**SYO057^2.p** Simple textbook example 14
include('Axioms/LCL013^0.ax')
$\exists r$: $i → $i → $o: ¬ mvalid@(mforall_prop@λa: $i → $o: (mimplies@(mbox@r@(mimplies@(mbox@r@a)@a))@(mbox@r@a)))

**SYO058^4.p** ILTP problem SYJ101+1
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
ivalid@(iatom@$a$)  thf(axiom$_1$, axiom)
ivalid@(iatom@$a$)  thf(con, conjecture)

**SYO059^4.p** ILTP problem SYJ102+1
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
ivalid@(iatom@$a$)  thf(axiom$_1$, axiom)
ivalid@(inot@(inot@(iatom@$a$)))  thf(con, conjecture)

**SYO060^4.p** ILTP problem SYJ103+1
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
$b$: $i → $o  thf(b_type, type)
ivalid@(ior@(inot@(iatom@$a$))@(inot@(iatom@$b$)))  thf(axiom$_1$, axiom)
ivalid@(ior@(inot@(iatom@$b$))@(inot@(iatom@$a$)))  thf(con, conjecture)

**SYO061^4.p** ILTP Problem SYJ104+1
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
$b$: $i → $o  thf(b_type, type)
ivalid@(iimplies@(iatom@$a$)@(iatom@$b$))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$a$)@(iatom@$b$))  thf(con, conjecture)

**SYO062^4.002.p** ILTP Problem SYJ105+1.002
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
ivalid@(inot@(inot@(ior@(iatom@$a$)@(inot@(iatom@$a$)))))  thf(con, conjecture)

**SYO062^4.003.p** ILTP Problem SYJ105+1.003
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)
$b$: $i → $o  thf(b_type, type)
ivalid@(inot@(inot@(ior@(iand@(iatom@$a$)@(iatom@$b$))@(ior@(inot@(iatom@$a$))@(inot@(iatom@$b$))))))  thf(con, conject

**SYO062^4.004.p** ILTP Problem SYJ105+1.004
include('Axioms/LCL010^0.ax')
$a$: $i → $o  thf(a_type, type)

$b$: $i → $o thf(b_type, type)
$c$: $i → $o thf(c_type, type)
ivalid@(inot@(inot@(ior@(iand@(iatom@$a$)@(iand@(iatom@$b$)@(iatom@$c$)))@(ior@(inot@(iatom@$a$))@(ior@(inot@(iatom@$b$

**SYO063^4.p** ILTP Problem SYJ106+1
include('Axioms/LCL010^0.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
$s$: $i → $o thf(s_type, type)
$t$: $i → $o thf(t_type, type)
ivalid@(iatom@$s$) thf(axiom$_1$, axiom)
ivalid@(iimplies@(inot@(iimplies@(iatom@$t$)@(iatom@$r$)))@(iatom@$p$)) thf(axiom$_2$, axiom)
ivalid@(iimplies@(inot@(iand@(iimplies@(iatom@$p$)@(iatom@$q$))@(iimplies@(iatom@$t$)@(iatom@$r$))))@(iand@(inot@(inot@

**SYO064^4.001.p** ILTP Problem SYJ107+1.001
include('Axioms/LCL010^0.ax')
$a$: $i → $o thf(a_type, type)
$b$: $i → $o thf(b_type, type)
$c$: $i → $o thf(c_type, type)
ivalid@(iatom@$c$) thf(axiom$_1$, axiom)
ivalid@(ior@(ior@(iatom@$b$)@(iatom@$a$))@(iatom@$b$)) thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$a$)@(iand@(iatom@$b$)@(iatom@$c$))) thf(con, conjecture)

**SYO064^4.002.p** ILTP Problem SYJ107+1.002
include('Axioms/LCL010^0.ax')
$a$: $i → $o thf(a_type, type)
$a_1$: $i → $o thf(a1_type, type)
$a_2$: $i → $o thf(a2_type, type)
$b$: $i → $o thf(b_type, type)
$b_1$: $i → $o thf(b1_type, type)
ivalid@(iatom@$a_2$) thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$b$)@(ior@(ior@(iatom@$b_1$)@(iatom@$a_1$))@(iatom@$b_1$))) thf(axiom$_2$, axiom)
ivalid@(ior@(ior@(iatom@$b$)@(iatom@$a$))@(iatom@$b$)) thf(axiom$_3$, axiom)
ivalid@(ior@(iatom@$a$)@(ior@(iand@(iatom@$b$)@(iatom@$a_1$))@(iand@(iatom@$b_1$)@(iatom@$a_2$)))) thf(con, conjecture)

**SYO064^4.003.p** ILTP Problem SYJ107+1.003
include('Axioms/LCL010^0.ax')
$a$: $i → $o thf(a_type, type)
$a_1$: $i → $o thf(a1_type, type)
$a_2$: $i → $o thf(a2_type, type)
$a_3$: $i → $o thf(a3_type, type)
$b$: $i → $o thf(b_type, type)
$b_1$: $i → $o thf(b1_type, type)
$b_2$: $i → $o thf(b2_type, type)
ivalid@(iatom@$a_3$) thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$b_1$)@(ior@(ior@(iatom@$b_2$)@(iatom@$a_2$))@(iatom@$b_2$))) thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$b$)@(ior@(ior@(iatom@$b_1$)@(iatom@$a_1$))@(iatom@$b_1$))) thf(axiom$_3$, axiom)
ivalid@(ior@(ior@(iatom@$b$)@(iatom@$a$))@(iatom@$b$)) thf(axiom$_4$, axiom)
ivalid@(ior@(iatom@$a$)@(ior@(iand@(iatom@$b$)@(iatom@$a_1$))@(ior@(iand@(iatom@$b_1$)@(iatom@$a_2$))@(iand@(iatom@$b_2$)@(

**SYO064^4.004.p** ILTP Problem SYJ107+1.004
include('Axioms/LCL010^0.ax')
$a$: $i → $o thf(a_type, type)
$a_1$: $i → $o thf(a1_type, type)
$a_2$: $i → $o thf(a2_type, type)
$a_3$: $i → $o thf(a3_type, type)
$a_4$: $i → $o thf(a4_type, type)
$b$: $i → $o thf(b_type, type)
$b_1$: $i → $o thf(b1_type, type)
$b_2$: $i → $o thf(b2_type, type)
$b_3$: $i → $o thf(b3_type, type)

ivalid@(iatom@$a_4$)  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$b_2$)@(ior@(ior@(iatom@$b_3$)@(iatom@$a_3$))@(iatom@$b_3$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$b_1$)@(ior@(ior@(iatom@$b_2$)@(iatom@$a_2$))@(iatom@$b_2$)))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iatom@$b$)@(ior@(ior@(iatom@$b_1$)@(iatom@$a_1$))@(iatom@$b_1$)))  thf(axiom$_4$, axiom)
ivalid@(ior@(ior@(iatom@$b$)@(iatom@$a$))@(iatom@$b$))  thf(axiom$_5$, axiom)
ivalid@(ior@(iatom@$a$)@(ior@(iand@(iatom@$b$)@(iatom@$a_1$))@(ior@(iand@(iatom@$b_1$)@(iatom@$a_2$))@(ior@(iand@(iatom@$b$

**SYO065^4.001.p** ILTP Problem SYJ201+1.001
include('Axioms/LCL010^0.ax')
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$))))  thf(axiom$_1$,
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_3$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$))))  thf(axiom$_2$,
ivalid@(iimplies@(iequiv@(iatom@$p_3$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$))))  thf(axiom$_3$,
ivalid@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$)))  thf(con, conjecture)

**SYO065^4.002.p** ILTP Problem SYJ201+1.002
include('Axioms/LCL010^0.ax')
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
$p_5$: $i → $o  thf(p5_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_3$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_3$)@(iatom@$p_4$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_4$)@(iatom@$p_5$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_5$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iatom@$p_4$)@(iatom@$p_5$)))))  thf(con, conjectu

**SYO065^4.003.p** ILTP Problem SYJ201+1.003
include('Axioms/LCL010^0.ax')
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
$p_5$: $i → $o  thf(p5_type, type)
$p_6$: $i → $o  thf(p6_type, type)
$p_7$: $i → $o  thf(p7_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_3$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_3$)@(iatom@$p_4$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_4$)@(iatom@$p_5$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_5$)@(iatom@$p_6$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_6$)@(iatom@$p_7$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_7$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iatom@$p_4$)@(iand@(iatom@$p_5$)@(iand@(iatom@$p

**SYO066^4.001.p** ILTP Problem SYJ202+1.001
include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o  thf(o11_type, type)
$o_{21}$: $i → $o  thf(o21_type, type)
ivalid@(iatom@$o_{11}$)  thf(axiom$_1$, axiom)
ivalid@(iatom@$o_{21}$)  thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{11}$)@(iatom@$o_{21}$))  thf(con, conjecture)

**SYO066^4.002.p** ILTP Problem SYJ202+1.002
include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o  thf(o11_type, type)
$o_{12}$: $i → $o  thf(o12_type, type)
$o_{21}$: $i → $o  thf(o21_type, type)

$o_{22}$: $i → $o  thf(o22_type, type)
$o_{31}$: $i → $o  thf(o31_type, type)
$o_{32}$: $i → $o  thf(o32_type, type)
ivalid@(ior@(iatom@$o_{11}$)@(iatom@$o_{12}$))  thf(axiom$_1$, axiom)
ivalid@(ior@(iatom@$o_{21}$)@(iatom@$o_{22}$))  thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{31}$)@(iatom@$o_{32}$))  thf(axiom$_3$, axiom)
ivalid@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{21}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{31}$))@(ior@(iand@(iatom@$o_{21}$)@(iatom@

**SYO066^4.003.p** ILTP Problem SYJ202+1.003
include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o  thf(o11_type, type)
$o_{12}$: $i → $o  thf(o12_type, type)
$o_{13}$: $i → $o  thf(o13_type, type)
$o_{21}$: $i → $o  thf(o21_type, type)
$o_{22}$: $i → $o  thf(o22_type, type)
$o_{23}$: $i → $o  thf(o23_type, type)
$o_{31}$: $i → $o  thf(o31_type, type)
$o_{32}$: $i → $o  thf(o32_type, type)
$o_{33}$: $i → $o  thf(o33_type, type)
$o_{41}$: $i → $o  thf(o41_type, type)
$o_{42}$: $i → $o  thf(o42_type, type)
$o_{43}$: $i → $o  thf(o43_type, type)
ivalid@(ior@(iatom@$o_{11}$)@(ior@(iatom@$o_{12}$)@(iatom@$o_{13}$)))  thf(axiom$_1$, axiom)
ivalid@(ior@(iatom@$o_{21}$)@(ior@(iatom@$o_{22}$)@(iatom@$o_{23}$)))  thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{31}$)@(ior@(iatom@$o_{32}$)@(iatom@$o_{33}$)))  thf(axiom$_3$, axiom)
ivalid@(ior@(iatom@$o_{41}$)@(ior@(iatom@$o_{42}$)@(iatom@$o_{43}$)))  thf(axiom$_4$, axiom)
ivalid@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{21}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{31}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@

**SYO067^4.001.p** ILTP Problem SYJ203+1.001
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
ivalid@(iimplies@(ior@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$f$)))@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO067^4.002.p** ILTP Problem SYJ203+1.002
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iatom@$p_2$))@(ior@(iimplies@(iatom@$p_1$)@(iatom@$f$))@(iimplies@(iatom@$p_2$)@(i
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO067^4.003.p** ILTP Problem SYJ203+1.003
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$)))@(ior@(iimplies@(iatom@$p_1$)@(iatom@$f$))@(ior
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO067^4.004.p** ILTP Problem SYJ203+1.004
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$))))@(ior@(iimplies@(iatom@$p
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO068^4.001.p** ILTP Problem SYJ204+1.001

include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
ivalid@(iatom@$p_1$)  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO068^4.005.p** ILTP Problem SYJ204+1.005
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
$p_5$: $i → $o  thf(p5_type, type)
ivalid@(iatom@$p_5$)  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$p_2$)@(iimplies@(iatom@$p_2$)@(iatom@$p_1$)))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iatom@$p_3$)@(iimplies@(iatom@$p_3$)@(iatom@$p_2$)))  thf(axiom$_4$, axiom)
ivalid@(iimplies@(iatom@$p_4$)@(iimplies@(iatom@$p_4$)@(iatom@$p_3$)))  thf(axiom$_5$, axiom)
ivalid@(iimplies@(iatom@$p_5$)@(iimplies@(iatom@$p_5$)@(iatom@$p_4$)))  thf(axiom$_6$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO068^4.010.p** ILTP Problem SYJ204+1.010
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_{10}$: $i → $o  thf(p10_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
$p_5$: $i → $o  thf(p5_type, type)
$p_6$: $i → $o  thf(p6_type, type)
$p_7$: $i → $o  thf(p7_type, type)
$p_8$: $i → $o  thf(p8_type, type)
$p_9$: $i → $o  thf(p9_type, type)
ivalid@(iatom@$p_{10}$)  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$p_2$)@(iimplies@(iatom@$p_2$)@(iatom@$p_1$)))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iatom@$p_3$)@(iimplies@(iatom@$p_3$)@(iatom@$p_2$)))  thf(axiom$_4$, axiom)
ivalid@(iimplies@(iatom@$p_4$)@(iimplies@(iatom@$p_4$)@(iatom@$p_3$)))  thf(axiom$_5$, axiom)
ivalid@(iimplies@(iatom@$p_5$)@(iimplies@(iatom@$p_5$)@(iatom@$p_4$)))  thf(axiom$_6$, axiom)
ivalid@(iimplies@(iatom@$p_6$)@(iimplies@(iatom@$p_6$)@(iatom@$p_5$)))  thf(axiom$_7$, axiom)
ivalid@(iimplies@(iatom@$p_7$)@(iimplies@(iatom@$p_7$)@(iatom@$p_6$)))  thf(axiom$_8$, axiom)
ivalid@(iimplies@(iatom@$p_8$)@(iimplies@(iatom@$p_8$)@(iatom@$p_7$)))  thf(axiom$_9$, axiom)
ivalid@(iimplies@(iatom@$p_9$)@(iimplies@(iatom@$p_9$)@(iatom@$p_8$)))  thf(axiom$_{10}$, axiom)
ivalid@(iimplies@(iatom@$p_{10}$)@(iimplies@(iatom@$p_{10}$)@(iatom@$p_9$)))  thf(axiom$_{11}$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO069^4.001.p** ILTP Problem SYJ205+1.001
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iand@(iimplies@(iand@(iimplies@(iatom@$a_0$)@(iatom@$f$))@(iand@(iimplies@(iimplies@(iatom@$b_1$)@(iatom@$b_0$))@(i

**SYO069^4.002.p** ILTP Problem SYJ205+1.002
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)

$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iand@(iimplies@(iand@(iimplies@(iatom@$a_0$)@(iatom@$f$))@(iand@(iimplies@(iimplies@(iatom@$b_2$)@(iatom@$b_0$))@(i

**SYO069^4.003.p** ILTP Problem SYJ205+1.003
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$a_3$: $i → $o  thf(a3_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$b_3$: $i → $o  thf(b3_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iand@(iimplies@(iand@(iimplies@(iatom@$a_0$)@(iatom@$f$))@(iand@(iimplies@(iimplies@(iatom@$b_3$)@(iatom@$b_0$))@(i

**SYO069^4.004.p** ILTP Problem SYJ205+1.004
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$a_3$: $i → $o  thf(a3_type, type)
$a_4$: $i → $o  thf(a4_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$b_3$: $i → $o  thf(b3_type, type)
$b_4$: $i → $o  thf(b4_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iand@(iimplies@(iand@(iimplies@(iatom@$a_0$)@(iatom@$f$))@(iand@(iimplies@(iimplies@(iatom@$b_4$)@(iatom@$b_0$))@(i

**SYO070^4.001.p** ILTP Problem SYJ211+1.001
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iimplies@(iatom@$a_0$)@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_1$)))@(iatom@$b_0$))@(iatom@$a_1$))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_0$)))@(iatom@$a_1$))@(iatom@$a_0$))  thf(axiom$_3$, axiom)
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO070^4.002.p** ILTP Problem SYJ211+1.002
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iimplies@(iatom@$a_0$)@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_2$)))@(iatom@$b_0$))@(iatom@$a_2$))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_0$)))@(iatom@$a_1$))@(iatom@$a_0$))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_1$)))@(iatom@$a_2$))@(iatom@$a_1$))  thf(axiom$_4$, axiom)

ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO070^4.003.p** ILTP Problem SYJ211+1.003
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$a_3$: $i → $o  thf(a3_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$b_3$: $i → $o  thf(b3_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iimplies@(iatom@$a_0$)@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_3$)))@(iatom@$b_0$))@(iatom@$a_3$))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_0$)))@(iatom@$a_1$))@(iatom@$a_0$))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_1$)))@(iatom@$a_2$))@(iatom@$a_1$))  thf(axiom$_4$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_2$)))@(iatom@$a_3$))@(iatom@$a_2$))  thf(axiom$_5$, axiom)
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO070^4.004.p** ILTP Problem SYJ211+1.004
include('Axioms/LCL010^0.ax')
$a_0$: $i → $o  thf(a0_type, type)
$a_1$: $i → $o  thf(a1_type, type)
$a_2$: $i → $o  thf(a2_type, type)
$a_3$: $i → $o  thf(a3_type, type)
$a_4$: $i → $o  thf(a4_type, type)
$b_0$: $i → $o  thf(b0_type, type)
$b_1$: $i → $o  thf(b1_type, type)
$b_2$: $i → $o  thf(b2_type, type)
$b_3$: $i → $o  thf(b3_type, type)
$b_4$: $i → $o  thf(b4_type, type)
$f$: $i → $o  thf(f_type, type)
ivalid@(iimplies@(iatom@$a_0$)@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_4$)))@(iatom@$b_0$))@(iatom@$a_4$))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_0$)))@(iatom@$a_1$))@(iatom@$a_0$))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_1$)))@(iatom@$a_2$))@(iatom@$a_1$))  thf(axiom$_4$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_2$)))@(iatom@$a_3$))@(iatom@$a_2$))  thf(axiom$_5$, axiom)
ivalid@(iimplies@(iimplies@(inot@(inot@(iatom@$b_3$)))@(iatom@$a_4$))@(iatom@$a_3$))  thf(axiom$_6$, axiom)
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO071^4.001.p** ILTP Problem SYJ207+1.001
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iatom@$p_2$)))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iatom@$p_2$)))  thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$p_0$)@(ior@(iand@(iatom@$p_1$)@(iatom@$p_2$))@(inot@(iatom@$p_0$))))  thf(con, conjecture)

**SYO071^4.002.p** ILTP Problem SYJ207+1.002
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_3$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$
ivalid@(iimplies@(iequiv@(iatom@$p_3$)@(iatom@$p_4$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$
ivalid@(iimplies@(iequiv@(iatom@$p_4$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$

ivalid@(ior@(iatom@$p_0$)@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$))))@(inot@(iatom@$p_0$

**SYO071∧4.003.p** ILTP Problem SYJ207+1.003

include('Axioms/LCL010^0.ax')
$p_0$: $i → $o thf(p0_type, type)
$p_1$: $i → $o thf(p1_type, type)
$p_2$: $i → $o thf(p2_type, type)
$p_3$: $i → $o thf(p3_type, type)
$p_4$: $i → $o thf(p4_type, type)
$p_5$: $i → $o thf(p5_type, type)
$p_6$: $i → $o thf(p6_type, type)
ivalid@(iimplies@(iequiv@(iatom@$p_1$)@(iatom@$p_2$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_2$)@(iatom@$p_3$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_3$)@(iatom@$p_4$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_4$)@(iatom@$p_5$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_5$)@(iatom@$p_6$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(iimplies@(iequiv@(iatom@$p_6$)@(iatom@$p_1$))@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iat
ivalid@(ior@(iatom@$p_0$)@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iand@(iatom@$p_4$)@(iand@(iator

**SYO072∧4.001.p** ILTP Problem SYJ208+1.001

include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o thf(o11_type, type)
$o_{21}$: $i → $o thf(o21_type, type)
ivalid@(inot@(inot@(iatom@$o_{11}$))) thf(axiom$_1$, axiom)
ivalid@(inot@(inot@(iatom@$o_{21}$))) thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{11}$)@(iatom@$o_{21}$)) thf(con, conjecture)

**SYO072∧4.002.p** ILTP Problem SYJ208+1.002

include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o thf(o11_type, type)
$o_{12}$: $i → $o thf(o12_type, type)
$o_{21}$: $i → $o thf(o21_type, type)
$o_{22}$: $i → $o thf(o22_type, type)
$o_{31}$: $i → $o thf(o31_type, type)
$o_{32}$: $i → $o thf(o32_type, type)
ivalid@(ior@(iatom@$o_{11}$)@(inot@(inot@(iatom@$o_{12}$)))) thf(axiom$_1$, axiom)
ivalid@(ior@(iatom@$o_{21}$)@(inot@(inot@(iatom@$o_{22}$)))) thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{31}$)@(inot@(inot@(iatom@$o_{32}$)))) thf(axiom$_3$, axiom)
ivalid@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{21}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{31}$))@(ior@(iand@(iatom@$o_{21}$)@(iatom@

**SYO072∧4.003.p** ILTP Problem SYJ208+1.003

include('Axioms/LCL010^0.ax')
$o_{11}$: $i → $o thf(o11_type, type)
$o_{12}$: $i → $o thf(o12_type, type)
$o_{13}$: $i → $o thf(o13_type, type)
$o_{21}$: $i → $o thf(o21_type, type)
$o_{22}$: $i → $o thf(o22_type, type)
$o_{23}$: $i → $o thf(o23_type, type)
$o_{31}$: $i → $o thf(o31_type, type)
$o_{32}$: $i → $o thf(o32_type, type)
$o_{33}$: $i → $o thf(o33_type, type)
$o_{41}$: $i → $o thf(o41_type, type)
$o_{42}$: $i → $o thf(o42_type, type)
$o_{43}$: $i → $o thf(o43_type, type)
ivalid@(ior@(iatom@$o_{11}$)@(ior@(iatom@$o_{12}$)@(inot@(inot@(iatom@$o_{13}$))))) thf(axiom$_1$, axiom)
ivalid@(ior@(iatom@$o_{21}$)@(ior@(iatom@$o_{22}$)@(inot@(inot@(iatom@$o_{23}$))))) thf(axiom$_2$, axiom)
ivalid@(ior@(iatom@$o_{31}$)@(ior@(iatom@$o_{32}$)@(inot@(inot@(iatom@$o_{33}$))))) thf(axiom$_3$, axiom)
ivalid@(ior@(iatom@$o_{41}$)@(ior@(iatom@$o_{42}$)@(inot@(inot@(iatom@$o_{43}$))))) thf(axiom$_4$, axiom)
ivalid@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{21}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@$o_{31}$))@(ior@(iand@(iatom@$o_{11}$)@(iatom@

**SYO073∧4.001.p** ILTP Problem SYJ209+1.001

include('Axioms/LCL010^0.ax')

$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
ivalid@(iimplies@(ior@(iatom@$p_1$)@(iimplies@(inot@(inot@(iatom@$p_1$)))@(iatom@$f$)))@(iatom@$f$))  thf(axiom$_1$, axiom)
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO073^4.002.p** ILTP Problem SYJ209+1.002
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iatom@$p_2$))@(ior@(iimplies@(inot@(inot@(iatom@$p_1$)))@(iatom@$f$))@(iimplies@
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO073^4.003.p** ILTP Problem SYJ209+1.003
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iatom@$p_3$)))@(ior@(iimplies@(inot@(inot@(iatom@$p_1$)))@(ia
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO073^4.004.p** ILTP Problem SYJ209+1.004
include('Axioms/LCL010^0.ax')
$f$: $i → $o  thf(f_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
ivalid@(iimplies@(ior@(iand@(iatom@$p_1$)@(iand@(iatom@$p_2$)@(iand@(iatom@$p_3$)@(iatom@$p_4$))))@(ior@(iimplies@(inot@(in
ivalid@(iatom@$f$)  thf(con, conjecture)

**SYO074^4.001.p** ILTP Problem SYJ210+1.001
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
ivalid@(inot@(inot@(iatom@$p_1$)))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO074^4.002.p** ILTP Problem SYJ210+1.002
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
ivalid@(inot@(inot@(iatom@$p_2$)))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$p_2$)@(iimplies@(iatom@$p_2$)@(iatom@$p_1$)))  thf(axiom$_3$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO074^4.003.p** ILTP Problem SYJ210+1.003
include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
ivalid@(inot@(inot@(iatom@$p_3$)))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$p_2$)@(iimplies@(iatom@$p_2$)@(iatom@$p_1$)))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iatom@$p_3$)@(iimplies@(iatom@$p_3$)@(iatom@$p_2$)))  thf(axiom$_4$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO074^4.004.p** ILTP Problem SYJ210+1.004

include('Axioms/LCL010^0.ax')
$p_0$: $i → $o  thf(p0_type, type)
$p_1$: $i → $o  thf(p1_type, type)
$p_2$: $i → $o  thf(p2_type, type)
$p_3$: $i → $o  thf(p3_type, type)
$p_4$: $i → $o  thf(p4_type, type)
ivalid@(inot@(inot@(iatom@$p_4$)))  thf(axiom$_1$, axiom)
ivalid@(iimplies@(iatom@$p_1$)@(iimplies@(iatom@$p_1$)@(iatom@$p_0$)))  thf(axiom$_2$, axiom)
ivalid@(iimplies@(iatom@$p_2$)@(iimplies@(iatom@$p_2$)@(iatom@$p_1$)))  thf(axiom$_3$, axiom)
ivalid@(iimplies@(iatom@$p_3$)@(iimplies@(iatom@$p_3$)@(iatom@$p_2$)))  thf(axiom$_4$, axiom)
ivalid@(iimplies@(iatom@$p_4$)@(iimplies@(iatom@$p_4$)@(iatom@$p_3$)))  thf(axiom$_5$, axiom)
ivalid@(iatom@$p_0$)  thf(con, conjecture)

**SYO076^5.p** TPS problem THM114
cQ: $o  thf(cQ, type)
cP: $o  thf(cP, type)
(cP and (cP ⇒ cQ)) ⇒ cQ  thf(cTHM$_{114}$, conjecture)

**SYO077^5.p** TPS problem THM64
cP: $i → $o  thf(cP, type)
∃$x$: $i: ((cP@$x$) ⇒ ∀$y$: $i: (cP@$y$))  thf(cTHM$_{64}$, conjecture)

**SYO078^5.p** TPS problem THM49
cR: $o  thf(cR, type)
cP: $o  thf(cP, type)
cQ: $o  thf(cQ, type)
(cP ⟺ cQ) or (cQ ⟺ cR) or (cP ⟺ cR)  thf(cTHM$_{49}$, conjecture)

**SYO079^5.p** TPS problem THM50-A
Associativity of equivalence.
cR: $o  thf(cR, type)
cQ: $o  thf(cQ, type)
cP: $o  thf(cP, type)
((cP ⟺ cQ) ⟺ cR) ⇒ (cP ⟺ (cQ ⟺ cR))  thf(cTHM50_A, conjecture)

**SYO080^5.p** TPS problem THM200
Nepejvoda's problem; supposedly a difficult ND problem.
cB: $o  thf(cB, type)
cA: $o  thf(cA, type)
((((cA ⇒ cB) ⇒ cA) ⇒ cA) ⇒ cB) ⇒ cB  thf(cTHM$_{200}$, conjecture)

**SYO081^5.p** TPS problem THM137
Trivial theorem for logic lessons.
cB: $i  thf(cB, type)
cR: $i → $i → $o  thf(cR, type)
cA: $i  thf(cA, type)
∀$x$: $i: (cR@$x$@cA) ⇒ ∃$y$: $i: (cR@cB@$y$)  thf(cTHM$_{137}$, conjecture)

**SYO082^5.p** TPS problem BAFFLER-VARIANT
$f$: $i → $i → $i  thf($f$, type)
cP: $i → $o  thf(cP, type)
∃xy: $i: ∀xx: $i: ((cP@xy) ⇒ (cP@($f$@xy@xx)))  thf(cBAFFLER_VARIANT, conjecture)

**SYO083^5.p** TPS problem THM62
cP: $i → $i → $o  thf(cP, type)
cB: $i  thf(cB, type)
cA: $i  thf(cA, type)
(∀$u$: $i: (cP@cA@$u$) or ∀$v$: $i: (cP@$v$@cB)) ⇒ ∃$x$: $i: (cP@$x$@$x$)  thf(cTHM$_{62}$, conjecture)

**SYO084^5.p** TPS problem THM75
Related to THM87, which was used for CADE-6.
cP: $i → $i → $i → $o  thf(cP, type)
$k$: $i → $i  thf($k$, type)
$h$: $i → $i  thf($h$, type)
$a$: $i  thf($a$, type)

∃xv: $i: ∀xj: $i: ∃xq: $i: ((cP@a@xj@(h@xj) or cP@xv@xj@(k@xj)) ⇒ (cP@xv@xj@xq))  thf(cTHM$_{75}$, conjecture)

**SYO085∧5.p** TPS problem COM-DMG02
A propositional problem suggested by Jay Hunschel Kim.
d: $o  thf(d, type)
c: $o  thf(c, type)
b: $o  thf(b, type)
a: $o  thf(a, type)
s: $o  thf(s, type)
(¬ c and d or ¬ a and b or s) ⇒ (s or ¬ a and b or ¬ c and d)  thf(cCOM_DMG$_{02}$, conjecture)

**SYO086∧5.p** TPS problem THM50-11
Simple formula for debugging.
cR: $o  thf(cR, type)
cQ: $o  thf(cQ, type)
cP: $o  thf(cP, type)
(¬ cP and ((cQ and ¬ cR) or (¬ cQ and cR))) ⇒ (((cP and cQ) or (¬ cP and ¬ cQ)) ⇒ cR)  thf(cTHM50$_{11}$, conjecture)

**SYO087∧5.p** TPS problem THM50-13
Simple formula for debugging.
cR: $o  thf(cR, type)
cQ: $o  thf(cQ, type)
cP: $o  thf(cP, type)
∃xx: $i: ((¬ cP and ((cQ and ¬ cR) or (¬ cQ and cR))) ⇒ (((cP and cQ) or (¬ cP and ¬ cQ)) ⇒ cR))  thf(cTHM50$_{13}$, c

**SYO088∧5.p** TPS problem ARR-COM-DMG5
A propositional problem suggested by Jay Hunschel Kim.
t: $o  thf(t, type)
s: $o  thf(s, type)
p: $o  thf(p, type)
d: $o  thf(d, type)
c: $o  thf(c, type)
b: $o  thf(b, type)
a: $o  thf(a, type)
((p and (¬ a or ¬ b or ¬ c or ¬ d)) or (s ⇒ t)) ⇒ (((¬ a and b or ¬ c and d) and p) or (s ⇒ t))  thf(cARR_COM_DMG$_{5}$

**SYO089∧5.p** TPS problem DMG7
A propositional problem suggested by Jay Hunschel Kim.
t: $o  thf(t, type)
s: $o  thf(s, type)
q: $o  thf(q, type)
p: $o  thf(p, type)
(¬ ¬ (¬ p and q or ¬ s and t) and q or ¬ s and t or ¬ q or ¬ s or ¬ t) ⇒ (¬ (¬ (¬ p and q or ¬ s and t) and q or ¬ s and t) an

**SYO090∧5.p** TPS problem DMG8
A propositional problem suggested by Jay Hunschel Kim.
t: $o  thf(t, type)
s: $o  thf(s, type)
q: $o  thf(q, type)
p: $o  thf(p, type)
(¬ ¬ (¬ (¬ p and q or ¬ s and t) and q or ¬ s and t) and q or ¬ s and t or ¬ q or ¬ s or ¬ t) ⇒ (¬ (¬ (¬ (¬ p and q or ¬ s and

**SYO091∧5.p** TPS problem THM50Q
∀p: $o, q: $o, r: $o: (((p ⟺ q) ⟺ r) ⟺ (p ⟺ (q ⟺ r)))  thf(cTHM50Q, conjecture)

**SYO092∧5.p** TPS problem Y2141
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
∀xx: $i: ∃xy: $i: (cP@xx and (cQ@xy or cQ@xx)) ⇒ ∃xz: $i: (cP@xz and cQ@xz)  thf(cY$_{2141}$, conjecture)

**SYO093∧5.p** TPS problem THM63
cP: $i → $i → $o  thf(cP, type)
∀u: $i, v: $i, w: $i: (cP@u@v or cP@v@w) ⇒ ∃x: $i: ∀y: $i: (cP@x@y)  thf(cTHM$_{63}$, conjecture)

**SYO094∧5.p** TPS problem THM55A

cR: $i → $i → $o  thf(cR, type)
(∃x: $i: (cR@x@x) ⇒ ∀y: $i: (cR@y@y)) ⇒ ∃u: $i: ∀v: $i: ((cR@u@u) ⇒ (cR@v@v))  thf(cTHM55A, conjecture)

**SYO095^5.p** TPS problem THM81
cR: $i → $i → $o  thf(cR, type)
(∀s: $i, t: $i: ((cR@s@s) ⟺ (cR@s@t)) and ∀w: $i, z: $i: ((cR@w@w) ⟺ (cR@z@w))) ⇒ (∃x: $i: (cR@x@x) ⇒ ∀y: $i: (cR@y@y))  thf(cTHM$_{81}$, conjecture)

**SYO096^5.p** TPS problem LX1
cA: $i  thf(cA, type)
cQ: $i → $i → $o  thf(cQ, type)
cB: $i  thf(cB, type)
cR: $i → $i → $o  thf(cR, type)
(cR@cA@cB and ∀x: $i: (∃y: $i: (cR@x@y) ⇒ (cQ@x@x)) and ∀u: $i, v: $i: ((cQ@u@v) ⇒ ∀z: $i: (cR@z@v))) ⇒ ∃w: $i: (cR@cB@w and cQ@w@cA)  thf(cLX$_1$, conjecture)

**SYO098^5.p** TPS problem THM65
cQ: $i → $i → $o  thf(cQ, type)
cR: $i → $i → $o  thf(cR, type)
∀w: $i: ¬ cR@w@w ⇒ ∃x: $i, y: $i: (¬ cR@x@y and ((cQ@y@x) ⇒ ∀z: $i: (cQ@z@z)))  thf(cTHM$_{65}$, conjecture)

**SYO099^5.p** TPS problem THM78
cG: $i → $o  thf(cG, type)
cN: $i → $o  thf(cN, type)
cM: $i → $o  thf(cM, type)
∀r: $i: (cM@r) or ∃x: $i: ¬ cG@x or ¬ ∀y: $i: (cM@y) or ∃s: $i: (cN@s) or ¬ ∀z: $i: ¬ cN@z or ¬ ∀t: $i: (cG@t)  thf(cTHM

**SYO101^5.p** TPS problem THM83
cW: $i  thf(cW, type)
cR: $i → $i → $o  thf(cR, type)
cP: $i → $o  thf(cP, type)
∀x: $i: ∃y: $i: ((cP@x) ⇒ ∀z: $i: (cR@x@y and cP@z)) ⇒ ∃u: $i: ∀v: $i: ((cP@v) ⇒ (cR@cW@u))  thf(cTHM$_{83}$, conjec

**SYO102^5.p** TPS problem THM101
cP: $i → $i → $o  thf(cP, type)
(∀xx: $i: (cP@xx@xx) and ∀xx: $i, xy: $i, xz: $i: ((cP@xx@xy and cP@xz@xy) ⇒ (cP@xx@xz))) ⇒ ∀xu: $i, xv: $i, xw: $i: ((
(cP@xu@xw))  thf(cTHM$_{101}$, conjecture)

**SYO103^5.p** TPS problem THM147
Theorem 211 on page 120 of [Chu56].
imp: $i → $i → $i  thf(imp, type)
cT: $i → $o  thf(cT, type)
nt: $i → $i  thf(nt, type)
¬ ∀xp: $i, xq: $i: (¬ cT@(imp@xp@xq) or ¬ cT@xp or cT@xq) and ∀xp: $i, xq: $i: (cT@(imp@xp@(imp@xq@xp))) and ∀xp: $

**SYO104^5.p** TPS problem TTTP2129
y: $i  thf(y, type)
cQ: $i → $i → $o  thf(cQ, type)
cP: $i → $i → $o  thf(cP, type)
∀xx: $i: (cP@xx@y and cQ@xx@y) ⟺ (∀xx: $i: (cP@xx@y) and ∀xx: $i: (cQ@xx@y))  thf(cTTTP$_{2129}$, conjecture)

**SYO105^5.p** TPS problem X2201TEST
cR: $i → $o  thf(cR, type)
y: $i  thf(y, type)
cP: $i → $i → $i → $o  thf(cP, type)
cQ: $i → $i → $o  thf(cQ, type)
¬ ∃xx: $i: (cQ@xx@y) ⇒ ¬ ∀xz: $i: (∀xu: $i: (cP@xu@y@xz) ⇒ ¬ ∃xv: $i: (cR@xv)) ⟺ ∃xx: $i: ∀xz: $i: ∃xu: $i: ∀xv: $i: ¬
¬ (cP@xu@y@xz) ⇒ ¬ cR@xv  thf(cX2201TEST, conjecture)

**SYO107^5.p** TPS problem THM66
cP: $i → $o  thf(cP, type)
∃x: $i: ∀y: $i: ((cP@x) ⇒ (cP@y)) ⟺ ∃x: $i: ((cP@x) ⇒ ∀y: $i: (cP@y))  thf(cTHM$_{66}$, conjecture)

**SYO108^5.p** TPS problem THM79
cG: $i → $o  thf(cG, type)
cN: $i → $o  thf(cN, type)

cM: $i → $o  thf(cM, type)
∀r: $i: (cM@r) or ∃x: $i: ¬ cG@x or ¬ ∀y: $i: (cM@y or ∃s: $i: (cN@s)) or ¬ ∀z: $i: (¬ cN@z or ¬ ∀t: $i: (cG@t))  thf(cTH

**SYO109∧5.p** TPS problem THM271
cP: $i → $o  thf(cP, type)
cN: $i → $i → $o  thf(cN, type)
cM: $i → $i → $o  thf(cM, type)
(∀xx: $i: (∃xy: $i: (cM@xx@xy or cN@xx@xy) ⇒ (cP@xx)) and ∀xw: $i: ∃xu: $i: (∀xv: $i: (cM@xu@xv) or cN@xu@xw) and
(cM@xz@xw or cN@xz@xw or cM@xz@xz or cN@xz@xz))) ⇒ ∀xz: $i: (cP@xz)  thf(cTHM$_{271}$, conjecture)

**SYO111∧5.p** TPS problem THM80
cG: $i → $o  thf(cG, type)
cN: $i → $o  thf(cN, type)
cM: $i → $o  thf(cM, type)
(∀r: $i: (cM@r) or ∃x: $i: ¬ cG@x or ¬ ∀y: $i: (cM@y) or ∃s: $i: (cN@s) or ¬ ∀z: $i: ¬ cN@z or ¬ ∀t: $i: (cG@t)) ⇒
(∀r: $i: (cM@r) or ∃x: $i: ¬ cG@x or ¬ ∀y: $i: (cM@y or ∃s: $i: (cN@s)) or ¬ ∀z: $i: (¬ cN@z or ¬ ∀t: $i: (cG@t)))  thf(cT

**SYO112∧5.p** TPS problem THM53
cP: $i → $o  thf(cP, type)
∀x: $i: ((cP@x) ⟺ ∃y: $i: (cP@y)) ⟺ (∀x: $i: (cP@x) ⟺ ∃y: $i: (cP@y))  thf(cTHM$_{53}$, conjecture)

**SYO113∧5.p** TPS problem THM350
cNUMBER: $i → $o  thf(cNUMBER, type)
cODD: $i → $o  thf(cODD, type)
cEVEN: $i → $o  thf(cEVEN, type)
cS: $i → $i  thf(cS, type)
$c_0$: $i  thf($c_0$, type)
(cEVEN@$c_0$ and ∀xn: $i: ((cEVEN@xn) ⇒ (cEVEN@(cS@(cS@xn)))) and cODD@(cS@$c_0$) and ∀xn: $i: ((cODD@xn) ⇒
(cODD@(cS@(cS@xn)))) and ((cNUMBER@$c_0$ and cNUMBER@(cS@$c_0$) and ∀xx: $i: ((cNUMBER@xx and cNUMBER@(c
(cNUMBER@(cS@xx) and cNUMBER@(cS@(cS@xx))))) ⇒ ∀xx: $i: (cNUMBER@xx and cNUMBER@(cS@xx))) and ∀xn
(cEVEN@xn or cODD@xn))) ⇒ ∀xn: $i: (cNUMBER@xn)  thf(cTHM$_{350}$, conjecture)

**SYO114∧5.p** TPS problem THM119
$b$: $i  thf($b$, type)
cP: $i → $o  thf(cP, type)
$a$: $i  thf($a$, type)
$d$: $i  thf($d$, type)
cQ: $i → $o  thf(cQ, type)
$c$: $i  thf($c$, type)
cR: $i → $o  thf(cR, type)
¬ ∀xz: $i: ((cP@xz or cR@xz) and cQ@xz) and ∀xx: $i: ∃xy: $i: (cP@xx or ¬ cQ@xx or ¬ cQ@xy or ¬ cQ@$c$ or ¬ cQ@$d$) and

**SYO118∧5.p** TPS problem from BASIC-FO-THMS
$p$: $o  thf($p$, type)
$q$: $o  thf($q$, type)
((p ⇒ q) ⇒ p) ⇒ p  thf(cPEIRCE, conjecture)

**SYO119∧5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
cP: $i → $o  thf(cP, type)
∀xx: $i: (cP@xx) ⇒ (cP@$a$)  thf(cEXX$_1$, conjecture)

**SYO120∧5.p** TPS problem from BASIC-FO-THMS
cA: $i → $o  thf(cA, type)
∀$z_3$: $i: ((cA@$z_3$) ⇒ (cA@$z_3$))  thf(cSET80_pme, conjecture)

**SYO121∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $i → $i → $o  thf(cQ, type)
∃$e$: $i: ∀$k$: $i: (cQ@$k$@$e$@$k$)  thf(cTHM$_{27}$, conjecture)

**SYO122∧5.p** TPS problem from BASIC-FO-THMS
cEQ: $i → $i → $o  thf(cEQ, type)
∀xu: $i, xx: $i, xy: $i: (cEQ@xu@xy)  thf(cA_4A$_3$, conjecture)

**SYO123∧5.p** TPS problem from BASIC-FO-THMS
$b$: $i  thf($b$, type)

cP: $i → $o  thf(cP, type)
$a$: $i  thf($a$, type)
∀xx: $i: (cP@xx) ⇒ (cP@$a$ and cP@$b$)  thf(cALLCONJ$_2$, conjecture)

**SYO124^5.p** TPS problem from BASIC-FO-THMS
cQ: $o  thf(cQ, type)
cR: $o  thf(cR, type)
cP: $o  thf(cP, type)
(cP and (cR or cQ)) ⇒ ((cP and cR) or cQ)  thf(cDISJ_BUG, conjecture)

**SYO125^5.p** TPS problem from BASIC-FO-THMS
cR: $o  thf(cR, type)
cP: $o  thf(cP, type)
cQ: $o  thf(cQ, type)
((cP ⟺ cQ) and (cQ ⟺ cR)) ⇒ (cP ⟺ cR)  thf(cTRIV$_4$, conjecture)

**SYO126^5.p** TPS problem from BASIC-FO-THMS
cS: (($i → $o) → $o) → ($i → $o) → $o  thf(cS, type)
cP: (($i → $o) → $o) → $o  thf(cP, type)
$c_0$: ($i → $o) → $o  thf($c_0$, type)
cP@$c_0$ and ∀$x$: ($i → $o) → $o: ((cP@$x$) ⇒ (cP@(cS@$x$)))  thf(cSUPERSET_NAT, conjecture)

**SYO128^5.p** TPS problem from BASIC-FO-THMS
$r$: $o  thf($r$, type)
$p$: $o  thf($p$, type)
$q$: $o  thf($q$, type)
($p$ and ($q$ or $r$)) ⇒ (($p$ and $q$) or ($p$ and $r$))  thf(cDISJ_BUG$_2$, conjecture)

**SYO129^5.p** TPS problem from BASIC-FO-THMS
$c$: $i  thf($c$, type)
cP: $i → $o  thf(cP, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
∀xx: $i: (cP@xx) ⇒ (cP@$a$ and cP@$b$ and cP@$c$)  thf(cALLCONJ$_3$, conjecture)

**SYO130^5.p** TPS problem from BASIC-FO-THMS
cP: $i → $o  thf(cP, type)
(∃xx: $i: (cP@xx) ⇒ ∃xx: $i: (cP@xx)) ⇒ ∀xx: $i: ¬ cP@xx  thf(cSIMPLER_BUG, conjecture)

**SYO131^5.p** TPS problem from BASIC-FO-THMS
$f$: $i → $i  thf($f$, type)
cR: $i → $i → $o  thf(cR, type)
$a$: $i  thf($a$, type)
$g$: $i → $i  thf($g$, type)
(cR@($g$@($f$@$a$))@($f$@($g$@($f$@$a$)))) ⇒ ∃xx: $i: (cR@xx@($f$@xx))  thf(cEXAMPLE$_1$, conjecture)

**SYO132^5.p** TPS problem from BASIC-FO-THMS
cX: $i  thf(cX, type)
cS: $i → $o  thf(cS, type)
cT: $i → $o  thf(cT, type)
cP: ($i → $o) → $o  thf(cP, type)
(cP@cS and cT@cX and cS = cT) ⇒ (cP@cT and cS@cX)  thf(cTHM$_{503}$, conjecture)

**SYO133^5.p** TPS problem from BASIC-FO-THMS
cP$_2$: $i → $o  thf(cP$_2$, type)
cP$_1$: $i → $o  thf(cP$_1$, type)
∃xy: $i: ∀xx: $i: ((cP$_1$@xx and ((cP$_1$@xy) ⇒ (cP$_2$@xx))) ⇒ (cP$_2$@xy))  thf(cBAFFLER$_2$, conjecture)

**SYO134^5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
((cP@$a$) ⇒ ∀xx: $i: (cQ@xx)) ⇒ (∀xx: $i: (cP@xx) ⇒ (cQ@$a$))  thf(cADDHYP$_1$, conjecture)

**SYO135^5.p** TPS problem from BASIC-FO-THMS
$x$: $i  thf($x$, type)

cQ: $i → $o  thf(cQ, type)
$b$: $i  thf($b$, type)
cP: $i → $o  thf(cP, type)
$a$: $i  thf($a$, type)
(∀xx$_0$: $i: (cP@xx$_0$) or cQ@$x$) ⇒ ((cP@$a$ and cP@$b$) or cQ@$x$)  thf(cDUP_BUG, conjecture)

**SYO136∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $o  thf(cQ, type)
$x$: $i  thf($x$, type)
cB: $o  thf(cB, type)
cP: $i → $o  thf(cP, type)
((∃xx$_0$: $i: (cP@xx$_0$) ⇒ cB) ⇒ cB) ⇒ ((cQ@$x$) ⇒ ∃xx$_0$: $i: (cQ@xx$_0$))  thf(cADDHYP$_3$, conjecture)

**SYO137∧5.p** TPS problem from BASIC-FO-THMS
cN: $i → $o  thf(cN, type)
cM: $i → $o  thf(cM, type)
(∀xx: $i: ((cM@xx) ⟺ (cN@xx)) ⟺ ∀xx: $i: (cM@xx)) ⟺ ∀xx: $i: (cN@xx)  thf(cX$_{2304}$, conjecture)

**SYO138∧5.p** TPS problem from BASIC-FO-THMS
cS: $i → $o  thf(cS, type)
cP: $i → $o  thf(cP, type)
(∃xx: $i: (cP@xx) ⇒ ∃xx: $i: (cP@xx)) ⇒ ∀xx: $i: ((cP@xx) ⇒ (cS@xx))  thf(cSIMPLE_BUG, conjecture)

**SYO139∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
∃xy: $i: ((∃xx: $i: (cP@xx or ¬ cP@xx) and cQ@xy) or ¬ cQ@xy)  thf(cCOUNTER$_1$, conjecture)

**SYO140∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
∃xx: $i: (cP@xx) ⇒ (∀xx: $i: ((cP@xx) ⇒ (cQ@xx)) ⇒ ∃xx: $i: (cQ@xx))  thf(cADDHYP$_6$, conjecture)

**SYO141∧5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
cQ: $i → $o  thf(cQ, type)
$x$: $i  thf($x$, type)
cR: $i → $o  thf(cR, type)
cP: $i → $o  thf(cP, type)
((cP@$a$) ⇒ ∀xx$_0$: $i: (cQ@xx$_0$)) ⇒ (∀xx$_0$: $i: (cP@xx$_0$) ⇒ ((cR@$x$) ⇒ (cQ@$a$)))  thf(cADDHYP$_2$, conjecture)

**SYO142∧5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
$f$: $i → $i  thf($f$, type)
$p$: $i → $o  thf($p$, type)
∃xx: $i, xy: $i: (((p@xx) ⇒ (p@($f$@($f$@xy)))) and ((p@xy) ⇒ (p@($f$@($f$@$a$)))))  thf(cTEST$_4$, conjecture)

**SYO143∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
(¬ ∃xy: $i: ∀xx: $i: ((cP@xy) ⇒ (cP@xx)) or ∃xz: $i: (cQ@xz)) ⇒ ∃xz: $i: (cQ@xz)  thf(cDUP_BUG$_1$, conjecture)

**SYO144∧5.p** TPS problem from BASIC-FO-THMS
cC: $o  thf(cC, type)
$x$: $i  thf($x$, type)
cR$_3$: $i → $o  thf(cR$_3$, type)
cR$_2$: $i → $o  thf(cR$_2$, type)
cR$_1$: $i → $o  thf(cR$_1$, type)
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
(∀xx$_0$: $i: (cP@xx$_0$) ⇒ ∀xx$_0$: $i: (cQ@xx$_0$)) ⇒ ((cR$_1$@$x$ or cR$_2$@$x$ or cR$_3$@$x$) ⇒ cC)  thf(cADDHYP$_7$, conjecture)

**SYO145∧5.p** TPS problem from BASIC-FO-THMS
cP: $i → $i → $o  thf(cP, type)
∀xx: $i: ∃xy: $i: (cP@xx@xy) ⇒ ∀xx: $i: ∃xy: $i, xz: $i: (cP@xy@xz and cP@xx@xy)  thf(cEXPVAR_BUG, conjecture)

**SYO146∧5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
cQ: $i → $o  thf(cQ, type)
$c$: $i  thf($c$, type)
cP: $i → $i → $o  thf(cP, type)
$b$: $i  thf($b$, type)
∀xx: $i: (∀xy: $i: (cP@xx@xy) or cQ@xx) ⇒ ((cP@$a$@$b$ and cP@$a$@$c$) or cQ@$a$)  thf(cDUP_EXPL$_1$, conjecture)

**SYO147∧5.p** TPS problem from BASIC-FO-THMS
cP$_3$: $i → $o  thf(cP$_3$, type)
cP$_2$: $i → $o  thf(cP$_2$, type)
cP$_1$: $i → $o  thf(cP$_1$, type)
∃xy: $i: ∀xx: $i: ((cP$_1$@xx and ((cP$_1$@xy) ⇒ (cP$_2$@xx)) and ((cP$_2$@xy) ⇒ (cP$_3$@xx))) ⇒ (cP$_3$@xy))  thf(cBAFFLER$_3$

**SYO148∧5.p** TPS problem from BASIC-FO-THMS
$a$: $tType  thf(a_type, type)
cZ: $a$ → $o  thf(cZ, type)
cY: $a$ → $o  thf(cY, type)
cX: $a$ → $o  thf(cX, type)
∀$u$: $a$: (¬ cX@$u$ ⟺ ((cY@$u$) ⟺ (cZ@$u$))) ⇒ cX = (λ$u$: $a$: ¬ (cY@$u$) ⟺ (cZ@$u$))  thf(cBOOL$_{25}$, conjecture)

**SYO149∧5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
$f$: $i → $i  thf($f$, type)
cP: $i → $o  thf(cP, type)
cQ: $i → $o  thf(cQ, type)
(∀xx: $i: ((cP@xx) ⇒ (cQ@($f$@xx))) and ∀xy: $i: ((cQ@xy) ⇒ (cP@xy)) and cP@$a$) ⇒ (cP@($f$@$a$))  thf(cSIMPLEPQ

**SYO150∧5.p** TPS problem from BASIC-FO-THMS
cC: $o  thf(cC, type)
$x$: $i  thf($x$, type)
cR$_4$: $i → $o  thf(cR$_4$, type)
cR$_3$: $i → $o  thf(cR$_3$, type)
cR$_2$: $i → $o  thf(cR$_2$, type)
cR$_1$: $i → $o  thf(cR$_1$, type)
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
(∀xx$_0$: $i: (cP@xx$_0$) ⇒ ∀xx$_0$: $i: (cQ@xx$_0$)) ⇒ ((cR$_1$@$x$ or cR$_2$@$x$ or cR$_3$@$x$ or cR$_4$@$x$) ⇒ cC)  thf(cADDHYP$_8$, conje

**SYO151∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $i → $i → $o  thf(cQ, type)
∀$x$: $i, $y$: $i: (∃$g$: $i: (cQ@$g$@$x$@$y$) and ∃$j$: $i: (cQ@$x$@$j$@$y$) and ∃$f$: $i: (cQ@$x$@$y$@$f$))  thf(cHYP$_2$, conjecture)

**SYO152∧5.p** TPS problem from BASIC-FO-THMS
cR: $o  thf(cR, type)
cS: $o  thf(cS, type)
cP: $o  thf(cP, type)
cQ: $o  thf(cQ, type)
∃xx: $i, xy: $i: (((∀xu: $i, xv: $i: cP or cQ) and ∀xz: $i: cR) ⇒ ¬ (¬ cP and ¬ cS) or ¬ cR)  thf(cQUANTIFIER_BUG, con

**SYO153∧5.p** TPS problem from BASIC-FO-THMS
cAPP: $i → $i → $i  thf(cAPP, type)
cReduct: $i → $i → $o  thf(cReduct, type)
cApp: $i → $i → $i  thf(cApp, type)
∀xx: $i, xy: $i, xz: $i: ((cReduct@xx@xy) ⇒ (cReduct@(cAPP@xx@xz)@(cApp@xy@xz) and cReduct@(cAPP@xz@xx)@(cA

**SYO154∧5.p** TPS problem from BASIC-FO-THMS
cR: $i → $o  thf(cR, type)
$g$: $i → $i  thf($g$, type)
cQ: $i → $o  thf(cQ, type)
$f$: $i → $i  thf($f$, type)
cP: $i → $o  thf(cP, type)
$a$: $i  thf($a$, type)
(cP@$a$ and ∀xx: $i: ((cP@xx) ⇒ (cQ@($f$@xx))) and ∀xy: $i: ((cQ@xy) ⇒ (cR@($g$@xy)))) ⇒ ∃xw: $i: (cR@xw)  thf(cD

**SYO155∧5.p** TPS problem from BASIC-FO-THMS
cS: $i → $o  thf(cS, type)
cP: $i → $o  thf(cP, type)
((∃xx: $i: (cP@xx) ⇒ ∃xx: $i: (cP@xx)) and (∃xx: $i: (cP@xx) ⇒ ∃xx: $i: (cP@xx))) ⇒ ∀xx: $i: ((cP@xx) ⇒ (cS@xx))  thf(cPELL26$_4$, conjecture)

**SYO156∧5.p** TPS problem from BASIC-FO-THMS
cR: $o  thf(cR, type)
cP: $o  thf(cP, type)
cQ: $o  thf(cQ, type)
(¬ cP or cQ) and (cP or ¬ cQ) and (¬ cQ or cR) and (cQ or ¬ cR) and (¬ cP or ¬ cR) and (cP or cR)  thf(cCNF_NTRIV

**SYO157∧5.p** TPS problem from BASIC-FO-THMS
cR: $i → $o  thf(cR, type)
cP: $i → $o  thf(cP, type)
cS: $i → $o  thf(cS, type)
cQ: $i → $o  thf(cQ, type)
(∀xx: $i: ((cP@xx) ⇒ (cR@xx)) ⇒ ∀xx: $i: ((cQ@xx) ⇒ (cS@xx))) and (∀xx: $i: ((cQ@xx) ⇒ (cS@xx)) ⇒ ∀xx: $i: ((cP@xx) ⇒ (cR@xx)))  thf(cPELL26$_1$, conjecture)

**SYO158∧5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $i → $i → $o  thf(cQ, type)
∀$x$: $i, $y$: $i, $z$: $i, $u$: $i, $v$: $i, vV: $i: ((cQ@$x$@$y$@$u$ and cQ@$y$@$z$@$v$) ⇒ ((cQ@$x$@$v$@vV) ⟺ (cQ@$u$@$z$@vV)))  thf(cHY

**SYO159∧5.p** TPS problem from BASIC-FO-THMS
cC: $i → $o  thf(cC, type)
cB: $i → $i → $o  thf(cB, type)
cA: $i → $o  thf(cA, type)
¬ ∀xx: $i: ((cA@xx) ⇒ ∃xy: $i: (cB@xx@xy and cC@xy)) ⇒ ∃xu: $i: (cA@xu and ¬ ∃xv: $i: ¬ (cB@xu@xv) ⇒ ¬ cC@xv)  thf(cNNF_EXAMPLE, conjecture)

**SYO160∧5.p** TPS problem from BASIC-FO-THMS
$c$: $i  thf($c$, type)
cR: $i → $o  thf(cR, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
((∀xx: $i: (cP@xx) or ∀xx: $i: (cQ@xx)) and ∀xx: $i: ((cP@xx) ⇒ (cR@xx)) and ∀xx: $i: ((cQ@xx) ⇒ (cR@xx))) ⇒ (cR@$a$ and cR@$b$ and cR@$c$)  thf(cDISJ_THIRD, conjecture)

**SYO161∧5.p** TPS problem from BASIC-FO-THMS
cP: $i → $o  thf(cP, type)
∃xx: $i: ∀xy: $i: (((cP@xx) ⇒ (cP@xy)) and ((cP@xy) ⇒ (cP@xx))) ⇒ ((∃xx: $i: (cP@xx) ⇒ ∀xy: $i: (cP@xy)) and (∀xy
∃xx: $i: (cP@xx)))  thf(cX2125_HALF, conjecture)

**SYO163∧5.p** TPS problem from BASIC-FO-THMS
cT: $i → $o  thf(cT, type)
$i$: $i → $i → $i  thf($i$, type)
$n$: $i → $i  thf($n$, type)
$z$: $i  thf($z$, type)
∀xx: $i, xy: $i: (cT@($i$@xx@($i$@xy@xx)) and cT@($i$@($i$@xx@($i$@xy@$z$))@($i$@($i$@xx@xy)@($i$@xx@$z$))) and cT@($i$@($i$@($n$@xx)
(cT@xy)))  thf(cMORGAN_AXIOMS, conjecture)

**SYO164∧5.p** TPS problem from BASIC-FO-THMS
cR: $i → $o  thf(cR, type)
cP: $i → $o  thf(cP, type)
cS: $i → $o  thf(cS, type)
cQ: $i → $o  thf(cQ, type)
((∃xx: $i: (cP@xx) ⇒ ∃xx: $i: (cQ@xx)) and (∃xx: $i: (cQ@xx) ⇒ ∃xx: $i: (cP@xx))) ⇒ ((∀xx: $i: ((cP@xx) ⇒ (cR@xx)) ⇒ ∀xx: $i: ((cQ@xx) ⇒ (cS@xx))) and (∀xx: $i: ((cQ@xx) ⇒ (cS@xx)) ⇒ ∀xx: $i: ((cP@xx) ⇒ (cR@xx))))  thf(cPELL26$_2$, conjecture)

**SYO165∧5.p** TPS problem from BASIC-FO-THMS
cP: $i → $o  thf(cP, type)

$s$: $i  thf($s$, type)
cE: $i → $i → $o  thf(cE, type)
cR: $i → $i → $o  thf(cR, type)
(∀xx: $i, xz: $i: ((cE@xz@xx) ⇒ ∃xy: $i: (cE@xy@xx and ∀xw: $i: ((cR@xy@xw) ⇒ ¬ cE@xw@xx))) and ∀xs$_0$: $i, xx: $i: (∀
(cP@xy)) ⇒ (cP@xx))) ⇒ ∀xx: $i: ((cE@xx@$s$) ⇒ (cP@xx))  thf(cTHM117A, conjecture)

**SYO166^5.p** TPS problem from BASIC-FO-THMS
$n$: $i → $i  thf($n$, type)
$i$: $i → $i → $i  thf($i$, type)
cT: $i → $o  thf(cT, type)
$z$: $i  thf($z$, type)
∀xx: $i, xy: $i: (cT@($i$@xx@($i$@xy@xx)) and cT@($i$@($i$@xx@($i$@xy@$z$))@($i$@($i$@xx@xy)@($i$@xx@$z$))) and cT@($i$@($i$@($n$@xx)
(cT@xy))) ⇒ ∀xx: $i: (cT@($i$@($n$@($n$@xx))@xx))  thf(cPELL$_{67}$, conjecture)

**SYO167^5.p** TPS problem from BASIC-FO-THMS
$n$: $i → $i  thf($n$, type)
$i$: $i → $i → $i  thf($i$, type)
cT: $i → $o  thf(cT, type)
$z$: $i  thf($z$, type)
∀xx: $i, xy: $i: (cT@($i$@xx@($i$@xy@xx)) and cT@($i$@($i$@xx@($i$@xy@$z$))@($i$@($i$@xx@xy)@($i$@xx@$z$))) and cT@($i$@($i$@($n$@xx)
(cT@xy))) ⇒ ∀xx: $i: (cT@($i$@xx@($n$@($n$@xx))))  thf(cPELL$_{66}$, conjecture)

**SYO168^5.p** TPS problem from BASIC-FO-THMS
$n$: $i → $i  thf($n$, type)
$i$: $i → $i → $i  thf($i$, type)
cT: $i → $o  thf(cT, type)
$z$: $i  thf($z$, type)
∀xx: $i, xy: $i: (cT@($i$@xx@($i$@xy@xx)) and cT@($i$@($i$@xx@($i$@xy@$z$))@($i$@($i$@xx@xy)@($i$@xx@$z$))) and ∀xx$_0$: $i, xy$_0$: $i: (cT
(cT@xy))) ⇒ ∀xx: $i: (cT@($i$@xx@($n$@($n$@xx))))  thf(cPELL$_{68}$, conjecture)

**SYO169^5.p** TPS problem from BASIC-FO-THMS
ab: $i  thf(ab, type)
$a$: $i  thf($a$, type)
$b$: $i  thf($b$, type)
cP: $i → $i → $i → $o  thf(cP, type)
cPx: $i → $i → $o  thf(cPx, type)
$e$: $i  thf($e$, type)
(∀xx: $i: (cP@$e$@xx@xx) and ∀xy: $i: (cP@xy@$e$@xy) and ∀xz: $i: (cP@xz@xz@$e$) and ∀xx: $i, xy: $i, xz: $i, xxy: $i, xyz: $i, xx
((cP@xxy@xz@xxyz) ⟺ (cPx@xyz@xxyz)))) ⇒ ((cP@$a$@$b$@ab) ⇒ (cP@$b$@$a$@ab))  thf(cGRP_COMM, conjecture)

**SYO170^5.p** TPS problem from BASIC-FO-THMS
ab: $i  thf(ab, type)
$a$: $i  thf($a$, type)
$b$: $i  thf($b$, type)
cP: $i → $i → $i → $o  thf(cP, type)
$e$: $i  thf($e$, type)
(∀xx: $i: (cP@$e$@xx@xx) and ∀xy: $i: (cP@xy@$e$@xy) and ∀xz: $i: (cP@xz@xz@$e$) and ∀xx: $i, xy: $i, xz: $i, xxy: $i, xyz: $i, xx
((cP@xxy@xz@xxyz) ⟺ (cP@xx@xyz@xxyz)))) ⇒ ((cP@$a$@$b$@ab) ⇒ (cP@$b$@$a$@ab))  thf(cTHM$_{105}$, conjecture)

**SYO171^5.p** TPS problem from BASIC-FO-THMS
$a$: $i  thf($a$, type)
$g$: $i → $i → $o  thf($g$, type)
$f$: $i → $i  thf($f$, type)
¬ ∀$a$: $i: ($g$@$a$@$a$ or $g$@($f$@$a$)@$a$) and ∀$a$: $i: ($g$@$a$@$a$ or $g$@$a$@($f$@$a$)) and ∀$a$: $i, $b$: $i: (¬ $g$@$a$@$b$ or $g$@($f$@$b$)@$b$) and ∀$a$: $i,

**SYO173^5.p** TPS problem from BASIC-FO-THMS
nt: $i → $i  thf(nt, type)
imp: $i → $i → $i  thf(imp, type)
cT: $i → $o  thf(cT, type)
¬ ∀xp: $i, xq: $i: (¬ cT@(imp@xp@xq) or ¬ cT@xp or cT@xq) and ∀xp: $i, xq: $i: (cT@(imp@xp@(imp@xq@xp))) and ∀xp: $

**SYO174^5.p** TPS problem from BASIC-FO-THMS
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)

cS: $i → $o  thf(cS, type)
cR: $i → $o  thf(cR, type)
((∃xx: $i: ∀xy: $i: ((cP@xx) ⟺ (cP@xy)) ⟺ (∃xx: $i: (cQ@xx) ⟺ ∀xy: $i: (cR@xy))) ⟺
(∃xx: $i: ∀xy: $i: ((cQ@xx) ⟺ (cQ@xy)) ⟺ (∃xx: $i: (cR@xx) ⟺ ∀xy: $i: (cS@xy)))) ⟺
((∃xx: $i: ∀xy: $i: ((cR@xx) ⟺ (cR@xy)) ⟺ (∃xx: $i: (cS@xx) ⟺ ∀xy: $i: (cP@xy))) ⟺
(∃xx: $i: ∀xy: $i: ((cS@xx) ⟺ (cS@xy)) ⟺ (∃xx: $i: (cP@xx) ⟺ ∀xy: $i: (cQ@xy))))  thf(cTHM$_{138}$, conjecture)

**SYO175∧5.p** TPS problem from BASIC-FO-THMS
$p$: $tType  thf(p_type, type)
$a$: $tType  thf(a_type, type)
cGRAIN: $p$  thf(cGRAIN, type)
cVEG_EATS: $a → p →$ $o  thf(cVEG_EATS, type)
cMEAT_EATS: $a → a →$ $o  thf(cMEAT_EATS, type)
cSNAIL: $a$  thf(cSNAIL, type)
cCATERPILLAR: $a$  thf(cCATERPILLAR, type)
cBIRD: $a$  thf(cBIRD, type)
cWOLF: $a$  thf(cWOLF, type)
cFOX: $a$  thf(cFOX, type)
cSMALLER: $a → a →$ $o  thf(cSMALLER, type)
(∀xx: $a$: (∀xy: $p$: (cVEG_EATS@xx@xy) or ∀xz: $a$: ((cSMALLER@xz@xx and ∃xw: $p$: (cVEG_EATS@xz@xw)) ⇒
(cMEAT_EATS@xx@xz))) and cSMALLER@cCATERPILLAR@cBIRD and cSMALLER@cSNAIL@cBIRD and cSMALLE
∃xx: $a$, xy: $a$: (cMEAT_EATS@xx@xy and cVEG_EATS@xy@cGRAIN)  thf(cPUZ031_1_HO, conjecture)

**SYO176∧5.p** TPS problem from BASIC-FO-THMS
cG: $o  thf(cG, type)
cM: $o  thf(cM, type)
cK: $o  thf(cK, type)
cR: $o  thf(cR, type)
cC: $o  thf(cC, type)
cB: $o  thf(cB, type)
cF: $o  thf(cF, type)
cP: $o  thf(cP, type)
cN: $o  thf(cN, type)
cE: $o  thf(cE, type)
cL: $o  thf(cL, type)
((cL and cP) ⇒ cM) and ((cG and ¬ cR) ⇒ cM) and ((¬ cK and cN and cM) ⇒ cF) and ((¬ cG and ¬ cP) ⇒
cR) and ((cK and cB) ⇒ cC) and ((cR and ¬ cN and ¬ cF) ⇒ cP) and ((cL and cM) ⇒ cC) and ((cE and ¬ cK and cG a
¬ cM) and ((¬ cG and ¬ cR) ⇒ cK) and ((cK and cL and cE) ⇒ ¬ cM) and ((cR and cE) ⇒ ¬ cC) and ((cG and ¬ cK an
¬ cB) and ((cN and ¬ cP and ¬ cF) ⇒ cC) and ((cG and cB and ¬ cR) ⇒ ¬ cC) and ((cR and ¬ cK and ¬ cM) ⇒
cG)  thf(cPORKCHOP, conjecture)

**SYO178∧5.p** TPS problem from BASIC-FO-THMS
cM: $o  thf(cM, type)
cN: $o  thf(cN, type)
cG: $o  thf(cG, type)
cK: $o  thf(cK, type)
cE: $o  thf(cE, type)
cR: $o  thf(cR, type)
cF: $o  thf(cF, type)
cC: $o  thf(cC, type)
cB: $o  thf(cB, type)
cP: $o  thf(cP, type)
cL: $o  thf(cL, type)
¬ cL and cE and (¬ cF or cB) and (¬ cL or ¬ cP or cM) and (¬ cG or cR or cM) and (cG or cP or cR) and (¬ cK or ¬ cB or

**SYO179∧5.p** TPS problem from BASIC-FO-THMS
cG: $i → $i → $o  thf(cG, type)
cR: $i → $i → $o  thf(cR, type)
cF: $i  thf(cF, type)
cE: $i  thf(cE, type)
cD: $i  thf(cD, type)

cC: $i  thf(cC, type)
cB: $i  thf(cB, type)
cA: $i  thf(cA, type)
((cR@cA@cB or cG@cA@cB) and (cR@cA@cC or cG@cA@cC) and (cR@cA@cD or cG@cA@cD) and (cR@cA@cE or cG@c
(∃xa: $i, xb: $i, xc: $i: (cR@xa@xb and cR@xa@xc and cR@xb@xc) or ∃xa: $i, xb: $i, xc: $i: (cG@xa@xb and cG@xa@xc and

**SYO180∧5.p** TPS problem from BASIC-FO-THMS
$\forall l$: $o, $p$: $o, $m$: $o, $g$: $o, $r$: $o, $e$: $o, $n$: $o, $f$: $o, $k$: $o, $b$: $o, $c$: $o: ((((l and p) ⇒ m) and ((g and ¬ r) ⇒ m) and ((¬ k and n and m) ⇒ f) and ((¬ g and ¬ p) ⇒ r) and ((k and b) ⇒ c) and ((r and ¬ n and ¬ f) ⇒ p) and ((l and m) ⇒ c) and ((e and ¬ k and g and ¬ n) ⇒ ¬ m) and ((¬ g and ¬ r) ⇒ k) and ((k and l and e) ⇒ ¬ m) and ((r and e) ⇒ ¬ c) and ((g and ¬ k and ¬ m) ⇒ ¬ b) and ((n and ¬ p and ¬ f) ⇒ c) and ((g and b and ¬ r) ⇒ ¬ c) and ((r and ¬ k and ¬ m) ⇒ g)) ⇒ ((e and l) ⇒ (f and ¬ b)))  thf(cPORKCHOP$_2$, conjecture)

**SYO183∧5.p** TPS problem CT2
$a$: $o  thf($a$, type)
∃xp: $o → $o: (xp@$a$)  thf(cCT$_2$, conjecture)

**SYO183∧6.p** TPS problem THM123
Trivial theorem to test TPS.
∀xp: $o: ∃xf: $o → $o: (xf@xp)  thf(cTHM$_{123}$, conjecture)

**SYO184∧5.p** TPS problem CT9
∃xx: $o, xy: $o: xx  thf(cCT$_9$, conjecture)

**SYO185∧5.p** TPS problem CT17
$y$: $o  thf($y$, type)
∃xx: $o: ($y$ ⇒ $y$)  thf(cCT$_{17}$, conjecture)

**SYO186∧5.p** TPS problem CT11
∀xy: $o: ∃xy$_0$: $o: xy$_0$  thf(cCT$_{11}$, conjecture)

**SYO187∧5.p** TPS problem CT10
∃xx: $o: ∀xy: $o: xx  thf(cCT$_{10}$, conjecture)

**SYO188∧5.p** TPS problem CT19
∃xq: ($o → $o) → $o: ∀xp: $o → $o: (xq@xp)  thf(cCT$_{19}$, conjecture)

**SYO189∧5.p** TPS problem CT5
∃xx: $o: ∀xy: $o: (xx ⇒ xy)  thf(cCT$_5$, conjecture)

**SYO190∧5.p** TPS problem CT15
∃xx: $o, xy: $o: (xx or xy)  thf(cCT$_{15}$, conjecture)

**SYO191∧5.p** TPS problem CT14
∃xz: $o, xx: $o: xx = xx  thf(cCT$_{14}$, conjecture)

**SYO192∧5.p** TPS problem CT12
∃xx: $o, xy: $o: xx = xy  thf(cCT$_{12}$, conjecture)

**SYO193∧5.p** TPS problem CT20
¬ ∀xq: ($o → $o) → $o: ¬ ∃xp: $o → $o: (xq@xp)  thf(cCT$_{20}$, conjecture)

**SYO194∧5.p** TPS problem CT23
∀xx: $i: ∃xf: $i → $i: (xf@xx) = xx  thf(cCT$_{23}$, conjecture)

**SYO195∧5.p** TPS problem CT25
¬ ∀xx: $o, xy: $o: xx = xy  thf(cCT$_{25}$, conjecture)

**SYO196∧5.p** TPS problem CT21
∃xp: $o → $o: (xp@∀xy: $o: (xy and ¬ xy))  thf(cCT$_{21}$, conjecture)

**SYO197∧5.p** TPS problem CT18
∃xy: $o: ∀xz: $o: ∃xx: $o: (xz ⇒ xx)  thf(cCT$_{18}$, conjecture)

**SYO198∧5.p** TPS problem CT8
∀xx: $o, xy: $o: ∃xp: $o → $o: (xp@xx and xp@xy)  thf(cCT$_8$, conjecture)

**SYO199∧5.p** TPS problem CT7
∃xp: $o → $o: ∀xx: $o, xy: $o: (xp@xx and xp@xy)  thf(cCT$_7$, conjecture)

**SYO200∧5.p** TPS problem CT4
∀xx: $o, xy: $o: ∃xp: $o → $o: ((xp@xx) ⇒ (xp@xy))  thf(cCT$_4$, conjecture)

**SYO202^5.p** TPS problem CT22
$\neg\,\exists$xp: \$o $\rightarrow$ \$o: (xp@xp = xp and $\neg$ xp@xp = xp)  thf(cCT$_{22}$, conjecture)

**SYO203^5.p** TPS problem PROP-2003-3-13
$r$: \$o  thf($r$, type)
$p$: \$o  thf($p$, type)
$q$: \$o  thf($q$, type)
$(q \Rightarrow r) \Rightarrow ((\neg q \Rightarrow \neg p) \Rightarrow (p \Rightarrow r))$  thf(cPROP_2003_3$_{13}$, conjecture)

**SYO204^5.p** TPS problem CT313
$\exists$xz: \$o, xx: \$o: $\forall$xy: \$o: (xx $\Rightarrow$ xy)  thf(cCT$_{313}$, conjecture)

**SYO205^5.p** TPS problem CT27
$\exists$xx: \$o, xy: \$o: xx = xy = xy = xx  thf(cCT$_{27}$, conjecture)

**SYO206^5.p** TPS problem CT265
$\exists$xx: \$o: $\forall$xy: \$o: xx = xy = xy = xx  thf(cCT$_{265}$, conjecture)

**SYO207^5.p** TPS problem CT26
$\forall$xx: \$o, xy: \$o: xx = xy = xy = xx  thf(cCT$_{26}$, conjecture)

**SYO208^5.p** TPS problem CT31
$a$: \$tType  thf(a_type, type)
$\neg\,\exists$xg: $a \rightarrow a \rightarrow$ \$o: $\forall$xf: $a \rightarrow$ \$o: $\exists$xj: $a$: (xg@xj) = xf = xf = xf  thf(cCT$_{31}$, conjecture)

**SYO209^5.p** TPS problem CT29
$a$: \$tType  thf(a_type, type)
$\neg\,\exists$xg: $a \rightarrow a \rightarrow$ \$o: $\forall$xf: $a \rightarrow$ \$o: $\exists$xj: $a$: $\forall$xp: $(a \rightarrow$ \$o$) \rightarrow$ \$o: ((xp@(xg@xj)) $\Rightarrow$ (xp@xf))  thf(cCT$_{29}$, conjecture)

**SYO210^5.p** TPS problem from BASIC-HO-PROP-THMS
$\exists$xx: \$o: xx = $\neg$ xx  thf(cCT$_{6}$, conjecture)

**SYO211^5.p** TPS problem from BASIC-HO-PROP-THMS
$x$: \$i  thf($x$, type)
$\exists$xy: \$i: $\forall$xf: \$i $\rightarrow$ \$i: (xf@$x$) = $x$  thf(cCT$_{24}$, conjecture)

**SYO212^5.p** TPS problem from BASIC-HO-PROP-THMS
$b$: \$o  thf($b$, type)
$a$: \$o  thf($a$, type)
$\forall$xp: \$o $\rightarrow$ \$o: ((xp@$a$ and xp@$b$) $\Rightarrow$ (xp@($a$ and $b$)))  thf(cEMB$_{2}$, conjecture)

**SYO213^5.p** TPS problem from BASIC-HO-PROP-THMS
$a$: \$tType  thf(a_type, type)
$\neg\,\exists$xg: $a \rightarrow a \rightarrow$ \$o: $\forall$xf: $a \rightarrow$ \$o: $\exists$xj: $a$: $\forall$xp: \$o $\rightarrow$ \$o: ((xp@(xg@xj) = xf) $\Rightarrow$ (xp@xf = xf))  thf(cCT$_{30}$, conjecture)

**SYO214^5.p** TPS problem THM12
$\forall r$: \$i $\rightarrow$ \$o, $s$: \$i $\rightarrow$ \$o: ($r = s \Rightarrow \forall x$: \$i: (($s$@$x$) $\Rightarrow$ ($r$@$x$)))  thf(cTHM$_{12}$, conjecture)

**SYO215^5.p** TPS problem THM26
$\exists x$: \$i, $y$: \$i: $x \neq y \Rightarrow \forall u$: \$i: $\exists z$: \$i: $z \neq u$  thf(cTHM$_{26}$, conjecture)

**SYO216^5.p** TPS problem THM107
$b$: \$tType  thf(b_type, type)
$\forall x$: $b \rightarrow b$, $y$: $b \rightarrow b$, $z$: $b \rightarrow b$: ($\lambda w$: $b$: ($x$@($y$@($z$@$w$)))) = ($\lambda w$: $b$: ($x$@($y$@($z$@$w$))))  thf(cTHM107_pme, conjecture)

**SYO217^5.p** TPS problem THM174
Principle of extensionality for binary relations.
$b$: \$tType  thf(b_type, type)
$a$: \$tType  thf(a_type, type)
$\forall$xr: $b \rightarrow a \rightarrow$ \$o, xs: $b \rightarrow a \rightarrow$ \$o: ($\forall$xx: $b$, xy: $a$: ((xr@xx@xy) $\iff$ (xs@xx@xy)) $\Rightarrow$ xr = xs)  thf(cTHM$_{174}$, conjecture)

**SYO218^5.p** TPS problem THM7B
Half-proved version of thm7 for test purposes.
$\forall$xx: \$i, xy: \$i: ($\forall$xq: (\$i $\rightarrow$ \$o) $\rightarrow$ \$i: (xx = (xq@$\lambda$xz: \$i: xx = xz) $\Rightarrow$ xy = (xq@$\lambda$xz: \$i: xy = xz)) $\Rightarrow$ xx = xy)  thf(cTHM7B_pme, conjecture)

**SYO219^5.p** TPS problem THM6
cS: \$i $\rightarrow$ \$i  thf(cS, type)
$\forall m$: \$i: (cS@$m$) $\neq m \Rightarrow \neg\,\exists g$: \$i $\rightarrow$ \$i $\rightarrow$ \$i: $\forall f$: \$i $\rightarrow$ \$i: $\exists j$: \$i: ($g$@$j$) = $f$  thf(cTHM$_{6}$, conjecture)

**SYO220^5.p** TPS problem THM47A

$\forall x$: \$i, $y$: \$i: ($x = y \Rightarrow \forall r$: \$i → \$i → \$o: ($\forall z$: \$i: ($r@z@z$) ⇒ ($r@x@y$))) thf(cTHM47A, conjecture)

**SYO221^5.p** TPS problem BLEDSOE6
$b$: \$i thf($b$, type)
cP: \$i → \$o thf(cP, type)
$a$: \$i thf($a$, type)
$\exists a$: \$i → \$o: ((cP@$a$ and $a \neq b$) ⇒ ($\forall$xx: \$i: (($a$@xx) ⇒ (cP@xx)) and $\exists$xy: \$i: ($a$@xy) and ¬ $a$@$b$)) thf(cBLEDSOE$_6$, co

**SYO222^5.p** TPS problem THM115A
Sunil's example.
$f$: \$i → \$i thf($f$, type)
$a$: \$i thf($a$, type)
cP: \$i → \$o thf(cP, type)
$\exists a$: \$i → \$o: ($\forall$xx: \$i: (($a$@($f$@xx)) ⇒ (cP@xx)) and ((cP@$a$ and $\forall$xx: \$i, xy: \$i: (($f$@xx) = ($f$@xy) ⇒ xx = xy)) ⇒ $\exists$xz: \$i: ($a$@xz))) thf(cTHM115A, conjecture)

**SYO223^5.p** TPS problem LING2
cJ: \$i thf(cJ, type)
cLIKE: \$i → \$i → \$o thf(cLIKE, type)
cUNIQUE: \$i → \$o thf(cUNIQUE, type)
cS: \$i thf(cS, type)
cP: \$i thf(cP, type)
($\forall x$: \$i: ((cUNIQUE@$x$) ⇒ $\forall z$: \$i: $x = z$) and cUNIQUE@cS) ⇒ $\exists$xan: \$i → \$o: ((xan@cP) = (cLIKE@cP@cS) and (xan@c
($\exists x$: \$i: (cUNIQUE@$x$ and cLIKE@cJ@$x$))) thf(cLING$_2$, conjecture)

**SYO224^5.p** TPS problem LING1
cJ: \$i thf(cJ, type)
cLIKE: \$i → \$i → \$o thf(cLIKE, type)
cWRH: \$i → \$o thf(cWRH, type)
cW: \$i → \$o thf(cW, type)
cUNIQUE: \$i → \$o thf(cUNIQUE, type)
cS: \$i thf(cS, type)
cP: \$i thf(cP, type)
($\forall x$: \$i: ((cUNIQUE@$x$) ⇒ $\forall z$: \$i: ((cWRH@$z$ and cW@$z$) ⇒ $x = z$)) and cUNIQUE@cS and cW@cS and cWRH@cS) ⇒
$\exists$xan: \$i → \$o: ((xan@cP) = (cLIKE@cP@cS) and (xan@cJ) = ($\exists x$: \$i: (cUNIQUE@$x$ and cW@$x$ and cWRH@$x$ and cLIKE

**SYO225^5.p** TPS problem THM126-CORRECTED
$g$: \$tType thf(g_type, type)
$b$: \$tType thf(b_type, type)
$a$: \$tType thf(a_type, type)
$\forall$xh$_1$: $g \to b$, xh$_2$: $b \to a$, xs$_1$: $g$ → \$o, xf$_1$: $g \to g \to g$, xs$_2$: $b$ → \$o, xf$_2$: $b \to b \to b$, xh$_{10}$: $g \to b$, xh$_{20}$: $b \to a$, xs$_{10}$: $g$ →
\$o, xf$_{10}$: $g \to g \to g$, xs$_{20}$: $b$ → \$o, xf$_{20}$: $b \to b \to b$, xs$_3$: $a \to$ \$o, xf$_3$: $a \to a \to a$: (($\forall$xx: $g$, xy: $g$: ((xs$_{10}$@xx and xs$_{10}$@xy) ⇒
(xs$_{10}$@(xf$_{10}$@xx@xy))) and $\forall$xx: $g$: ((xs$_{10}$@xx) ⇒ (xs$_{20}$@(xh$_{10}$@xx))) and $\forall$xx: $g$: ((xs$_{10}$@xx) ⇒ (xs$_{20}$@(xh$_{10}$@xx))) and $\forall$x
(xs$_{20}$@(xh$_{10}$@xx))) and $\forall$xx: $g$, xy: $g$: ((xs$_{10}$@xx and xs$_{10}$@xy) ⇒ (xh$_{10}$@(xf$_{10}$@xx@xy)) = (xf$_{20}$@(xh$_{10}$@xx)@(xh$_{10}$@xy))) a
(xs$_3$@(xf$_3$@xx@xy))) and $\forall$xx: $b$: ((xs$_{20}$@xx) ⇒ (xs$_3$@(xh$_{20}$@xx))) and $\forall$xx: $b$, xy: $b$: ((xs$_{20}$@xx and xs$_{20}$@xy) ⇒
(xh$_{20}$@(xf$_{20}$@xx@xy)) = (xf$_3$@(xh$_{20}$@xx)@(xh$_{20}$@xy)))) ⇒ ($\forall$xx: $g$, xy: $g$: ((xs$_{10}$@xx and xs$_{10}$@xy) ⇒ (xs$_{10}$@(xf$_{10}$@xx@xy)
(xs$_3$@(xf$_3$@xx@xy))) and $\forall$xx: $g$: ((xs$_{10}$@xx) ⇒ (xs$_3$@(xh$_{20}$@(xh$_{10}$@xx)))) and $\forall$xx: $g$, xy: $g$: ((xs$_{10}$@xx and xs$_{10}$@xy and xs
(xh$_{20}$@(xh$_{10}$@(xf$_{10}$@xx@xy))) = (xf$_3$@(xh$_{20}$@(xh$_{10}$@xx))@(xh$_{20}$@(xh$_{10}$@xy)))))) thf(cTHM126_CORRECTED_pme, con

**SYO226^5.p** TPS problem THM47B
$\forall x$: \$i, $y$: \$i: ($\forall r$: \$i → \$i → \$o: ($\forall z$: \$i: ($r@z@z$) ⇒ ($r@x@y$)) ⇒ $x = y$) thf(cTHM47B, conjecture)

**SYO227^5.p** TPS problem BLEDSOE4-W-AX
$c$: \$i thf($c$, type)
$b$: \$i thf($b$, type)
$a$: \$i thf($a$, type)
c_less_: \$i → \$i → \$o thf(c_less_, type)
$\forall$xx: \$i, xy: \$i: ((c_less_@xx@xy) ⇒ xx ≠ xy) ⇒ ((c_less_@$a$@$b$ and c_less_@$b$@$c$) ⇒ $\exists a$: \$i → \$o: (¬ $a$@$a$ and $a$@$b$ and ¬ $a$@

**SYO228^5.p** TPS problem THM126-EXPANDED
$g$: \$tType thf(g_type, type)
$b$: \$tType thf(b_type, type)
$a$: \$tType thf(a_type, type)

$\forall xh_1$: $g \to b, xh_2$: $b \to a, xs_1$: $g \to \$o, xf_1$: $g \to g \to g, xs_2$: $b \to \$o, xf_2$: $b \to b \to b, xs_3$: $a \to \$o, xf_3$: $a \to a \to$
$a$: ((∀xx: $g$, xy: $g$: ((xs$_1$@xx and xs$_1$@xy) ⇒ (xs$_1$@(xf$_1$@xx@xy))) and ∀xx: $b$, xy: $b$: ((xs$_2$@xx and xs$_2$@xy) ⇒
(xs$_2$@(xf$_2$@xx@xy))) and ∀xx: $g$: ((xs$_1$@xx) ⇒ (xs$_2$@(xh$_1$@xx))) and ∀xx: $g$, xy: $g$: ((xs$_1$@xx and xs$_1$@xy) ⇒
(xh$_1$@(xf$_1$@xx@xy)) = (xf$_2$@(xh$_1$@xx)@(xh$_1$@xy))) and ∀xx: $b$, xy: $b$: ((xs$_2$@xx and xs$_2$@xy) ⇒ (xs$_2$@(xf$_2$@xx@xy))) and ∀x
(xs$_3$@(xf$_3$@xx@xy))) and ∀xx: $b$: ((xs$_2$@xx) ⇒ (xs$_3$@(xh$_2$@xx))) and ∀xx: $b$, xy: $b$: ((xs$_2$@xx and xs$_2$@xy) ⇒
(xh$_2$@(xf$_2$@xx@xy)) = (xf$_3$@(xh$_2$@xx)@(xh$_2$@xy)))) ⇒ (∀xx: $g$, xy: $g$: ((xs$_1$@xx and xs$_1$@xy) ⇒ (xs$_1$@(xf$_1$@xx@xy))) and
(xs$_3$@(xf$_3$@xx@xy))) and ∀xx: $g$: ((xs$_1$@xx) ⇒ (xs$_3$@(xh$_2$@(xh$_1$@xx)))) and ∀xx: $g$, xy: $g$: ((xs$_1$@xx and xs$_1$@xy and xs$_1$@xx
(xh$_2$@(xh$_1$@(xf$_1$@xx@xy))) = (xf$_3$@(xh$_2$@(xh$_1$@xx))@(xh$_2$@(xh$_1$@xy)))))) thf(cTHM126_EXPANDED_pme, conjecture)

**SYO229^5.p** TPS problem from BASIC-HO-EQ-THMS
cB: $i → $o thf(cB, type)
cA: $i → $o thf(cA, type)
∃xu: $i → $o: xu = (λxx: $i: (cA@xx and cB@xx)) thf(cSV$_3$, conjecture)

**SYO230^5.p** TPS problem from BASIC-HO-EQ-THMS
cB: $i → $o thf(cB, type)
cA: $i → $o thf(cA, type)
∃xu: $i → $o: xu = (λxx: $i: (cA@xx or cB@xx)) thf(cSV$_2$, conjecture)

**SYO231^5.p** TPS problem from BASIC-HO-EQ-THMS
cB: $i → $o thf(cB, type)
cA: $i → $o thf(cA, type)
∃xu: $i → $o: xu = (λxx: $i: (¬ cA@xx and cB@xx)) thf(cSV$_6$, conjecture)

**SYO232^5.p** TPS problem from BASIC-HO-EQ-THMS
$a$: $tType thf(a_type, type)
cP: $a \to$ $o thf(cP, type)
$x$: $a$ thf($x$, type)
cB: $o thf(cB, type)
$y$: $i thf($y$, type)
($y = y$ ⇒ cB) ⇒ ((cP@$x$) ⇒ ∃xx$_0$: $a$: (cP@xx$_0$)) thf(cADDHYP$_4$, conjecture)

**SYO233^5.p** TPS problem from BASIC-HO-EQ-THMS
cN: $i → $i thf(cN, type)
cM: $i → $i thf(cM, type)
∀xx: $i, xp: $i → $o: ((xp@(cM@xx)) ⇒ (xp@(cN@xx))) ⇒ cM = cN thf(cLEIBNIZ, conjecture)

**SYO234^5.p** TPS problem from BASIC-HO-EQ-THMS
$d$: $tType thf(d_type, type)
$c$: $tType thf(c_type, type)
cB: $d \to c \to$ $o thf(cB, type)
cA: $c \to d \to$ $o thf(cA, type)
∃xu: $c \to d \to$ $o: xu = (λxx: $c$, xy: $d$: (cA@xx@xy or cB@xy@xx)) thf(cSV$_4$, conjecture)

**SYO235^5.p** TPS problem from BASIC-HO-EQ-THMS
cB: $o thf(cB, type)
cA: $o thf(cA, type)
(∀$q$: $o → $o: (($q$@cA) ⇒ ($q$@cB)) or (cA ⟺ cB)) ⇒ cA = cB thf(cTHM$_{505}$, conjecture)

**SYO236^5.p** TPS problem from BASIC-HO-EQ-THMS
$b$: $tType thf(b_type, type)
$a$: $tType thf(a_type, type)
$g$: $b \to a$ thf($g$, type)
$f$: $b \to a$ thf($f$, type)
(∀$q$: ($b \to a$) → $o: (($q$@$f$) ⇒ ($q$@$g$)) or ∀xx: $b$: ($f$@xx) = ($g$@xx)) ⇒ $f = g$ thf(cTHM$_{504}$, conjecture)

**SYO237^5.p** TPS problem from BASIC-HO-EQ-THMS
$g$: $i → $i thf($g$, type)
$p$: ($i → $i) → $o thf($p$, type)
$x$: $i thf($x$, type)
$q$: $i → $o thf($q$, type)
$f$: $i → $i thf($f$, type)
∀xx$_0$: $i: ($f$@xx$_0$) = ($g$@xx$_0$) ⇒ (($p$@λxx$_0$: $i: ($f$@xx$_0$)) ⇒ (($q$@$x$) ⇒ ($p$@λxx$_0$: $i: ($g$@xx$_0$)))) thf(cTHM$_{508}$, conjecture

**SYO238^5.p** TPS problem from BASIC-HO-EQ-THMS

cB: $o thf(cB, type)
$x$: $i thf($x$, type)
cP: $i → $o thf(cP, type)
$f$: $i → $i thf($f$, type)
($true ⇒ ∀xx$_0$: $i: ($f$@xx$_0$) = xx$_0$) ⇒ (((λxx$_0$: $i: ($f$@($f$@xx$_0$))) = (λxx$_0$: $i: xx$_0$) ⇒ cB) ⇒ ((cP@$x$) ⇒ cB)) thf(cADDHYP$_5$, conjecture)

**SYO239^5.p** TPS problem from BASIC-HO-EQ-THMS
$s$: $i → $i thf($s$, type)
$c_2$: $i thf($c_2$, type)
c_star: $i → $i → $i thf(c_star, type)
∀xx: $i: (∃xu: $i: xx = (c_star@$c_2$@xu) ⟺ ¬ ∃xv: $i: ($s$@xx) = (c_star@$c_2$@xv)) ⇒ ∃$a$: $i → $o: ∀xx: $i: (($a$@xx) ⟺ ¬ $a$@($s$@xx)) thf(cBLEDSOE_FENG_SV_EO1_W_LEM, conjecture)

**SYO240^5.p** TPS problem from BASIC-HO-EQ-THMS
$a$: $tType thf(a_type, type)
$b$: $tType thf(b_type, type)
cK: ($a$ → $b$ → $o) → $a$ → $b$ → $o thf(cK, type)
∀xu: $a$ → $b$ → $o, xv: $a$ → $b$ → $o: (∀xx: $a$, xy: $b$: ((xu@xx@xy) ⇒ (xv@xx@xy)) ⇒ ∀xx: $a$, xy: $b$: ((cK@xu@xx@xy) ⇒ (cK@xv@xx@xy))) ⇒ ∃xu: $a$ → $b$ → $o: (cK@xu) = xu thf(cTHM2B, conjecture)

**SYO241^5.p** TPS problem from BASIC-HO-EQ-THMS
∀xh: ($i → $o) → $i: (∀xp: $i → $o, xq: $i → $o: ((xh@xp) = (xh@xq) ⇒ xp = xq) ⇒ ¬ ∃xt: $i → $o: (¬ xt@(xh@xt) and (xh@λxz: $i: ∃xt$_0$: $i → $o: (¬ xt$_0$@(xh@xt$_0$) and xz = (xh@xt$_0$))) = (xh@xt))) thf(cTHM143_EX

**SYO242^5.p** TPS problem from BASIC-HO-EQ-THMS
$a$: $tType thf(a_type, type)
∃xf: ($a$ → $o) → $a$: ∀$x$: $a$ → $o: (∃xt: $a$: ($x$@xt) ⇒ ($x$@(xf@$x$))) ⇒ ∃$r$: $a$ → $a$ → $o: (∀xx: $a$, xy: $a$: (($r$@xx@xy and $r$@xy@x xx = xy) and ∀$s$: $a$ → $o: (∃xu: $a$: ($s$@xu) ⇒ ∃xv: $a$: ($s$@xv and ∀xz: $a$: ($r$@xv@xz)))) thf(cTHM$_{539}$, conjecture)

**SYO243^5.p** TPS problem from BASIC-HO-EQ-THMS
$f$: $i → $i thf($f$, type)
$g$: $i → $i thf($g$, type)
∀xr: $i → $i → $o: (∀xx: $i: ∃xy: $i: (xr@xx@xy) ⇒ ∃xh: $i → $i: ∀xx: $i: (xr@xx@(xh@xx))) ⇒ (∀xx: $i, xy: $i: (($g$@xx) = ($g$@xy) ⇒ ($f$@xx) = ($f$@xy)) ⇒ ∃xh: $i → $i: ∀xx: $i, xy: $i: (($g$@xx) = xy ⇒ (xh@xy) = ($f$@xx))) thf(cTHM588LEM

**SYO244^5.p** TPS problem from BASIC-HO-EQ-THMS
$a$: $tType thf(a_type, type)
∃xf: (($a$ → $o) → $o) → $a$ → $o: ∀$x$: ($a$ → $o) → $o: (∃xt: $a$ → $o: ($x$@xt) ⇒ ($x$@(xf@$x$))) ⇒ ∀$a$: (($a$ → $o) → $o) → $o: ((∃$x$: ($a$ → $o) → $o: ($a$@$x$) and ∀$x$: ($a$ → $o) → $o: (($a$@$x$) ⇒ ∃xu: $a$ → $o: ($x$@xu))) ⇒ (λxx: $a$: ∀xa: ($a$ → $o) → $o: (($a$@xa) ⇒ ∃xb: $a$ → $o: (xa@xb and xb@xx))) = (λxx: $a$: ∃xf: (($a$ → $o) → $o) → $a$ → $o: ∀xa: ($a$ → $o) → $o: (($a$@xa) ⇒ (xa@(xf@xa) and xf@xa@xx)))) thf(cTHM535B, conjecture)

**SYO245^5.p** TPS problem from BASIC-HO-EQ-THMS
∀xh: ($i → $o) → $i: (∃xt: $i → $o: (¬ xt@(xh@xt) and (xh@λxz: $i: ∃xt$_0$: $i → $o: (¬ xt$_0$@(xh@xt$_0$) and xz = (xh@xt$_0$))) = (xh@xt)) ⇒ ∃xt: $i → $o: (¬ xt@(xh@xt) and (xh@λxz: $i: ∃xt$_0$: $i → $o: (¬ xt$_0$@(xh@xt$_0$) and xz = (xh@xt$_0$))) = (xh@xt))) ⇒ ¬ ∃xh: ($i → $o) → $i: ∀xx: $i → $o, xy: $i → $o: ((xh@xx) = (xh@xy) ⇒ xx = xy) thf(cTHM193A, conjecture)

**SYO246^5.p** TPS problem from BASIC-HO-EQ-THMS
$a$: $tType thf(a_type, type)
∀xs: (($a$ → $o) → $o) → $o: (∀$x$: ($a$ → $o) → $o: ((xs@$x$) ⇒ ∃xt: $a$ → $o: ($x$@xt)) ⇒ ∃xf: (($a$ → $o) → $o) → $a$ → $o: ∀$x$: ($a$ → $o) → $o: ((xs@$x$) ⇒ ($x$@(xf@$x$)))) ⇒ ∀$a$: (($a$ → $o) → $o) → $o: ((∃$x$: ($a$ → $o) → $o: ($a$@$x$) and ∀$x$: ($a$ → $o) → $o: (($a$@$x$) ⇒ ∃xu: $a$ → $o: ($x$@xu))) ⇒ (λxx: $a$: ∀xa: ($a$ → $o) → $o: (($a$@xa) ⇒ ∃xb: $a$ → $o: (xa@xb and xb@xx))) = (λxx: $a$: ∃xf: (($a$ → $o) → $o) → $a$ → $o: ∀xa: ($a$ → $o) → $o: (($a$@xa) ⇒ (xa@(xf@xa) and xf@xa@xx)))) thf(cTHM$_{535}$, conjecture)

**SYO247^5.p** TPS problem from BASIC-HO-EQ-THMS
cP$_6$: $i thf(cP$_6$, type)
cP$_5$: $i thf(cP$_5$, type)
cP$_4$: $i thf(cP$_4$, type)
cP$_3$: $i thf(cP$_3$, type)
cP$_2$: $i thf(cP$_2$, type)
cP$_1$: $i thf(cP$_1$, type)

$\forall k$: \$i → \$i → \$o, $s$: \$i → \$o: (($s$@cP$_1$ and $s$@cP$_2$ and $s$@cP$_3$ and $s$@cP$_4$ and $s$@cP$_5$ and $s$@cP$_6$ and ∀xx: \$i, xy: \$i: (($k$@xx@
($k$@xy@xx))) ⇒ ∃xx: \$i, xy: \$i, xz: \$i: ($s$@xx and $s$@xy and $s$@xz and xx ≠ xy and xy ≠ xz and xz ≠ xx and (($k$@xx@xy an

**SYO248∧5.p** TPS problem from BASIC-HO-EQ-THMS
hh: \$i thf(hh, type)
$h$: \$i thf($h$, type)
ee: \$i thf(ee, type)
$e$: \$i thf($e$, type)
dd: \$i thf(dd, type)
$d$: \$i thf($d$, type)
cc: \$i thf(cc, type)
$c$: \$i thf($c$, type)
bb: \$i thf(bb, type)
$b$: \$i thf($b$, type)
aa: \$i thf(aa, type)
$a$: \$i thf($a$, type)
$\forall p$: \$i → \$i → \$o: (((((($p$@$a$) = ($p$@aa) and ($p$@$b$) = ($p$@bb) and ($p$@$e$) = ($p$@hh)) ⇒ ($p$@$c$) = ($p$@dd)) and (((($p$@$a$) =
($p$@aa) and ($p$@$h$) = ($p$@hh) and ($p$@$b$) = ($p$@cc)) ⇒ ($p$@$d$) ≠ ($p$@ee)) and ((($p$@$c$) = ($p$@cc) and ($p$@cc) =
($p$@$d$) and ($p$@$d$) = ($p$@dd) and ($p$@$a$) ≠ ($p$@bb)) ⇒ ($p$@$e$) ≠ ($p$@hh)) and ((($p$@$a$) = ($p$@aa) and ($p$@$d$) =
($p$@dd) and ($p$@$b$) ≠ ($p$@cc)) ⇒ ($p$@$e$) = ($p$@hh)) and ((($p$@$e$) = ($p$@ee) and ($p$@$h$) = ($p$@hh) and ($p$@$c$) =
($p$@dd)) ⇒ ($p$@$a$) ≠ ($p$@bb)) and ((($p$@$b$) = ($p$@bb) and ($p$@bb) = ($p$@$c$) and ($p$@$c$) = ($p$@cc) and ($p$@$e$) ≠
($p$@hh)) ⇒ ($p$@$d$) = ($p$@ee))) ⇒ (($p$@$a$) ≠ ($p$@aa) or ($p$@$b$) ≠ ($p$@bb) or ($p$@$c$) ≠ ($p$@cc) or ($p$@$d$) ≠
($p$@dd) or ($p$@$e$) ≠ ($p$@ee) or ($p$@$h$) ≠ ($p$@hh))) thf(cSIXFRIENDS_AGAIN, conjecture)

**SYO249∧5.p** TPS problem from BASIC-HO-EQ-THMS
cBIGPHI: \$i → \$i thf(cBIGPHI, type)
cHOM_FROM_HH$_1$: (\$i → \$i) → \$o thf(cHOM_FROM_HH$_1$, type)
cPHI$_2$: \$i → \$i thf(cPHI$_2$, type)
cHOM_FROM_SS_PRIME: (\$i → \$i) → \$o thf(cHOM_FROM_SS_PRIME, type)
cPHI$_1$: \$i → \$i thf(cPHI$_1$, type)
cSS_PRIME: \$i → \$o thf(cSS_PRIME, type)
el$_1$: \$i → (\$i → \$o) → \$o thf(el$_1$, type)
cHH$_1$: \$i → \$o thf(cHH$_1$, type)
cBIGHI: \$i → \$i thf(cBIGHI, type)
cHH$_2$: \$i → \$o thf(cHH$_2$, type)
cTIMES: \$i → \$i → \$i thf(cTIMES, type)
(∀xx$_1$: \$i, xx$_2$: \$i, xy$_1$: \$i, xy$_2$: \$i: ((el$_1$@xx$_1$@cHH$_2$ and el$_1$@xx$_2$@cHH$_2$ and el$_1$@xy$_1$@cHH$_2$ and el$_1$@xy$_2$@cHH$_2$ and xx$_1$ =
xx$_2$ and xy$_1$ = xy$_2$) ⇒ (cTIMES@xx$_1$@xy$_1$) = (cTIMES@xx$_2$@xy$_2$)) and ∀xx$_1$: \$i, xx$_2$: \$i: ((el$_1$@xx$_1$@cSS_PRIME and el$_1$@
(el$_1$@(cTIMES@xx$_1$@xx$_2$)@cSS_PRIME)) and ∀xx$_1$: \$i, xx$_2$: \$i, xy$_1$: \$i, xy$_2$: \$i: ((el$_1$@xx$_1$@cHH$_1$ and el$_1$@xx$_2$@cHH$_1$ and el$_1$@
xx$_2$ and xy$_1$ = xy$_2$) ⇒ (cTIMES@xx$_1$@xy$_1$) = (cTIMES@xx$_2$@xy$_2$)) and ∀xphi: \$i → \$i: ((cHOM_FROM_SS_PRIME@xphi
∀xx: \$i, xy: \$i: ((el$_1$@xx@cSS_PRIME and el$_1$@xy@cSS_PRIME) ⇒ (xphi@(cTIMES@xx@xy)) = (cTIMES@(xphi@xx)@(xp
∀xx: \$i, xy: \$i: ((el$_1$@xx@cHH$_1$ and el$_1$@xy@cHH$_1$) ⇒ (cBIGPHI@(cTIMES@xx@xy)) = (cTIMES@(cBIGPHI@xx)@(cBIG
(el$_1$@(cTIMES@xx@xy)@cHH$_1$)) and ∀xx: \$i: ((el$_1$@xx@cSS_PRIME) ⇒ (el$_1$@(cPHI$_2$@xx)@cHH$_2$)) and ∀xx: \$i: ((el$_1$@xx@
(el$_1$@(cBIGPHI@xx)@cHH$_2$)) and ∀xx: \$i: ((el$_1$@xx@cSS_PRIME) ⇒ (el$_1$@(cPHI$_1$@xx)@cHH$_1$)) and ∀xx: \$i, xy: \$i: ((el$_1$@x
xy) ⇒ (cBIGHI@xx) = (cBIGPHI@xy)) and ∀xx: \$i: ((el$_1$@xx@cSS_PRIME) ⇒ (cBIGPHI@(cPHI$_1$@xx)) =
(cPHI$_2$@xx)) and ∀xy: \$i: ((el$_1$@xy@cHH$_1$) ⇒ ∃xx: \$i: (el$_1$@xx@cSS_PRIME and (cPHI$_1$@xx) = xy)) and cHOM_FROM_SS
(cHOM_FROM_HH$_1$@cBIGPHI) thf(cPROB$_{757}$, conjecture)

**SYO252∧5.p** TPS problem THM123B
Trivial theorem to test TPS.
∀xp: \$o: ∃xf: \$o → \$o: ¬ xf@xp thf(cTHM123B, conjecture)

**SYO253∧5.p** TPS problem THM124
Example to show the need for primitive substitutions that introduce negation.
$p$: \$o thf($p$, type)
∃xf: \$o → \$o: (xf@($p$ and ¬ $p$) and ¬ xf@($p$ or ¬ $p$)) thf(cTHM$_{124}$, conjecture)

**SYO255∧5.p** TPS problem BLEDSOE3
cP: \$i → \$o thf(cP, type)
$a$: \$i thf($a$, type)
(cP@$a$) ⇒ ∃$a$: \$i → \$o: (∀xx: \$i: (($a$@xx) ⇒ (cP@xx)) and ∃xy: \$i: ($a$@xy)) thf(cBLEDSOE$_3$, conjecture)

**SYO256∧5.p** TPS problem THM121

Test theorem for nested primitive substitutions.
$a$: $tType  thf(a_type, type)
∀xr: $o → $o, xp: $a → $o, xq: $a → $o: ∃xh: $o: ((xr@xh) ⟺ (xr@∀xx: $a: (xp@xx or xq@xx)))  thf(cTHM$_{121}$, conjecture)

**SYO257^5.p** TPS problem THM84
$h$: $i → $i  thf($h$, type)
$g$: $i → $i  thf($g$, type)
cP: $i → $i → $o  thf(cP, type)
∃xx: $i: ∀xy: $i: (∀xf: $i → $i, xz: $i: (cP@xz@(xf@xx) and cP@xx@xy) ⇒ (cP@xy@($g$@($h$@xy))))  thf(cTHM$_{84}$, conjectu

**SYO258^5.p** TPS problem BLEDSOE-FENG-6
$a$: $i  thf($a$, type)
cQ: $i → ($i → $o) → $o  thf(cQ, type)
cP: $i → $i → $o  thf(cP, type)
$b$: $i  thf($b$, type)
(cP@$a$@$b$ and ∀$e$: $i → $o: (cQ@$b$@$e$)) ⇒ ∃$a$: $i → $o: ∀xg: $i: (($a$@xg) ⇒ (∃xx: $i: (cP@xg@xx and cQ@xx@$a$) and $a$@$a$))

**SYO259^5.p** TPS problem THM125B
Trivial theorem to test flexible-flexible pairs.
∀xa: $i, xb: $i, xc: $i, $p$: $i → $o: ∃xm: $i → $o, xn: $i → $o: ((xn@xa or xm@xa) and ($p$@xb or xn@xb) and (xm@xc or ¬ $p$@x

**SYO260^5.p** TPS problem THM125A
Trivial theorem to test flexible-flexible pairs.
∀xa: $i, xb: $i, xc: $i, $p$: $i → $o: ∃xm: $i → $o, xn: $i → $o: ((xm@xa or xn@xa) and ($p$@xb or xn@xb) and (xm@xc or ¬ $p$@x

**SYO261^5.p** TPS problem BLEDSOE-FENG-SV-I1
$n$: $i  thf($n$, type)
cP: $i → $o  thf(cP, type)
c1_plus: $i → $i  thf(c1_plus, type)
cO: $i  thf(cO, type)
(∀$a$: $i → $o: (($a$@cO and ∀xx: $i: (($a$@xx) ⇒ ($a$@(c1_plus@xx)))) ⇒ ($a$@$n$)) and cP@cO and ∀xx: $i: ((cP@xx) ⇒ (cP@(c1_plus@xx)))) ⇒ (cP@$n$)  thf(cBLEDSOE_FENG_SV_I$_1$, conjecture)

**SYO262^5.p** TPS problem THM19SK1
cP: $i → $i → $o  thf(cP, type)
cE: ($i → $o) → $i  thf(cE, type)
¬ ∀xx: $i: (cP@xx@(cE@λxy: $i: (cP@xx@xy))) and ∀xf: $i → $i: ¬ cP@(cE@λxx: $i: ¬ cP@xx@(xf@xx))@(xf@(cE@λxx: $i: -

**SYO263^5.p** TPS problem THM125D
Trivial theorem to test flexible-flexible pairs.
∀xa: $i, xb: $i, xc: $i, $p$: $i → $o: ∃xm: $i → $o, xn: $i → $o: ((xn@xa or xm@xa) and ($p$@xb or xn@xb) and (xm@xc or ¬ $p$@x
¬ $p$@xx))  thf(cTHM125D, conjecture)

**SYO264^5.p** TPS problem THM125C
Trivial theorem to test flexible-flexible pairs.
∀xa: $i, xb: $i, xc: $i, $p$: $i → $o: ∃xm: $i → $o, xn: $i → $o: ((xm@xa or xn@xa) and ($p$@xb or xn@xb) and (xm@xc or ¬ $p$@x
¬ $p$@xx))  thf(cTHM125C, conjecture)

**SYO265^5.p** TPS problem X5210
$a$: $tType  thf($a$_type, type)
$x$: $a$  thf($x$, type)
(λxx: $a$, xy: $a$: xx = xy@$x$) = (λxz: $a$: ∃xy: $a$: (xy = $x$ and xz = xy))  thf(cX$_{5210}$, conjecture)

**SYO266^5.p** TPS problem THM44
cQ: $i → $o  thf(cQ, type)
cP: $i → $o  thf(cP, type)
∃$s$: $i → $o: ∀$x$: $i: (($s$@$x$ or cP@$x$) and (¬ $s$@$x$ or cQ@$x$)) ⟺ ∀$y$: $i: (cP@$y$ or cQ@$y$)  thf(cTHM$_{44}$, conjecture)

**SYO267^5.p** TPS problem THM111
∀$p$: $i → $o: ∃$m$: ($i → $i) → $o: ∀$g$: $i → $i, $h$: $i → $i: (($m$@$g$ and $m$@$h$) ⇒ ($m$@λz: $i: ($g$@($h$@z)) and ∀$y$: $i: (($p$@$y$) ⇒ ($p$@($g$@$y$)))))  thf(cTHM$_{111}$, conjecture)

**SYO268^5.p** TPS problem X5308
$a$: $tType  thf($a$_type, type)
$b$: $tType  thf($b$_type, type)
$r$: $a$ → $b$ → $o  thf($r$, type)

$\exists$xj: $(b \to \$o) \to b$: $\forall$xp: $b \to \$o$: ($\exists$xx: $b$: (xp@xx) $\Rightarrow$ (xp@(xj@xp))) $\Rightarrow$ ($\forall$xx: $a$: $\exists$xy: $b$: ($r$@xx@xy) $\iff$ $\exists$xf: $a \to b$: $\forall$xx: $a$: ($r$@xx@(xf@xx)))  thf($\mathrm{cX}_{5308}$, conjecture)

**SYO269^5.p** TPS problem THM112D
$\forall p$: \$i $\to$ \$o: $\exists \mathrm{xm}_9$: (\$i $\to$ \$i) $\to$ \$i $\to$ \$o, $\mathrm{xm}_{10}$: (\$i $\to$ \$i) $\to$ \$i $\to$ \$o: ($\forall \mathrm{xw}_1$: \$i: ($\mathrm{xm}_9$@$\lambda$xx: \$i: xx@$\mathrm{xw}_1$ or $\mathrm{xm}_{10}$@$\lambda$xx: \$i: xx@
\$i, $h$: \$i $\to$ \$i: (($\forall \mathrm{xw}_1$: \$i: ($\mathrm{xm}_9$@$g$@$\mathrm{xw}_1$ or $\mathrm{xm}_{10}$@$g$@$\mathrm{xw}_1$) and $\forall \mathrm{xw}_1$: \$i: ($\mathrm{xm}_9$@$g$@$\mathrm{xw}_1$ or $\mathrm{xm}_{10}$@$g$@$\mathrm{xw}_1$) and $\forall \mathrm{xw}_1$: \$i: ($\mathrm{xm}_9$@
($\forall \mathrm{xw}_1$: \$i: ($\mathrm{xm}_9$@$\lambda$xx: \$i: ($g$@($h$@xx))@$\mathrm{xw}_1$ or $\mathrm{xm}_{10}$@$\lambda$xx: \$i: ($g$@($h$@xx))@$\mathrm{xw}_1$) and $\forall y$: \$i: (($p$@$y$) $\Rightarrow$ ($p$@($g$@$y$)))))))  th

**SYO270^5.p** TPS problem THM85
$h$: \$i $\to$ \$i  thf($h$, type)
$g$: \$i $\to$ \$i  thf($g$, type)
cP: \$i $\to$ \$i $\to$ \$o  thf(cP, type)
$\exists$xx: \$i, xf: \$i $\to$ \$i: $\forall$xy: \$i: (($\forall$xz: \$i: (cP@xz@(xf@xx)) and cP@xx@xy) $\Rightarrow$ (cP@xy@($g$@($h$@xy))))  thf($\mathrm{cTHM}_{85}$, conject

**SYO271^5.p** TPS problem X5500
$b$: \$tType  thf(b_type, type)
$a$: \$tType  thf(a_type, type)
cJ: $(b \to \$o) \to b$  thf(cJ, type)
$\forall p$: $b \to \$o$: ($\exists$xx: $b$: ($p$@xx) $\Rightarrow$ ($p$@(cJ@$p$))) $\Rightarrow$ $\forall$xf: $b \to a$, xg: $b \to a$: ((xf@(cJ@$\lambda$xx: $b$: (xf@xx) $\neq$ (xg@xx))) =
(xg@(cJ@$\lambda$xx: $b$: (xf@xx) $\neq$ (xg@xx))) $\Rightarrow$ xf = xg)  thf($\mathrm{cX}_{5500}$, conjecture)

**SYO272^5.p** TPS problem THM301A
cHALF: \$i $\to$ \$i $\to$ \$o  thf(cHALF, type)
cDOUBLE: \$i $\to$ \$i $\to$ \$o  thf(cDOUBLE, type)
cS: \$i $\to$ \$i  thf(cS, type)
$c_0$: \$i  thf($c_0$, type)
($\forall$xu: \$i, xv: \$i: ((cDOUBLE@xu@xv) $\iff$ $\forall q$: \$i $\to$ \$i $\to$ \$o: (($q$@$c_0$@$c_0$ and $\forall$xx: \$i, xy: \$i: (($q$@xx@xy) $\Rightarrow$
($q$@(cS@xx)@(cS@(cS@xy))))) $\Rightarrow$ ($q$@xu@xv))) and cHALF@$c_0$@$c_0$ and cHALF@(cS@$c_0$)@$c_0$ and $\forall$xx: \$i, xy: \$i: ((cHALF@
(cHALF@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$ $\forall$xu: \$i, xv: \$i: ((cDOUBLE@xu@xv) $\Rightarrow$ (cHALF@xv@xu))  thf(cTHM301A, co

**SYO274^5.p** TPS problem THM48-EXPD
$c$: \$tType  thf(c_type, type)
$b$: \$tType  thf(b_type, type)
$a$: \$tType  thf(a_type, type)
cG: $c \to b$  thf(cG, type)
cF: $b \to a$  thf(cF, type)
($\forall$xx: $b$, xy: $b$: ($\forall$xq: $a \to \$o$: ((xq@(cF@xx)) $\Rightarrow$ (xq@(cF@xy))) $\Rightarrow$ $\forall$xq: $b \to \$o$: ((xq@xx) $\Rightarrow$ (xq@xy))) and $\forall$xx: $c$, xy: $c$: (
\$o: ((xq@(cG@xx)) $\Rightarrow$ (xq@(cG@xy))) $\Rightarrow$ $\forall$xq: $c \to \$o$: ((xq@xx) $\Rightarrow$ (xq@xy)))) $\Rightarrow$ $\forall$xx: $c$, xy: $c$: ($\forall$xq: $a \to$
\$o: ((xq@(cF@(cG@xx))) $\Rightarrow$ (xq@(cF@(cG@xy)))) $\Rightarrow$ $\forall$xq: $c \to \$o$: ((xq@xx) $\Rightarrow$ (xq@xy)))  thf(cTHM48_EXPD, conje

**SYO275^5.p** TPS problem THM300A
cS: \$i $\to$ \$i  thf(cS, type)
cDOUBLE: \$i $\to$ \$i $\to$ \$o  thf(cDOUBLE, type)
cHALF: \$i $\to$ \$i $\to$ \$o  thf(cHALF, type)
$c_0$: \$i  thf($c_0$, type)
($\forall$xu: \$i, xv: \$i: ((cHALF@xu@xv) $\iff$ $\forall q$: \$i $\to$ \$i $\to$ \$o: (($q$@$c_0$@$c_0$ and $q$@(cS@$c_0$)@$c_0$ and $\forall$xx: \$i, xy: \$i: (($q$@xx@xy) $\Rightarrow$
($q$@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$ ($q$@xu@xv))) and cDOUBLE@$c_0$@$c_0$ and $\forall$xx: \$i, xy: \$i: ((cDOUBLE@xx@xy) $\Rightarrow$
(cDOUBLE@(cS@xx)@(cS@(cS@xy))))) $\Rightarrow$ $\forall$xu: \$i, xv: \$i: ((cHALF@xu@xv) $\Rightarrow$ (cDOUBLE@xv@xu or cDOUBLE@(cS@

**SYO276^5.p** TPS problem BLEDSOE-FENG-SV-I2
$m$: \$i  thf($m$, type)
cP: \$i $\to$ \$o  thf(cP, type)
$n$: \$i  thf($n$, type)
$s$: \$i $\to$ \$i  thf($s$, type)
cO: \$i  thf(cO, type)
($\forall a$: \$i $\to$ \$i $\to$ \$o: (($a$@cO@cO and $\forall$xx: \$i, xy: \$i: (($a$@xx@xy) $\Rightarrow$ ($a$@($s$@xx)@($s$@xy)))) $\Rightarrow$ ($a$@$n$@$m$)) and cP@$n$) $\Rightarrow$
(cP@$m$)  thf($\mathrm{cBLEDSOE\_FENG\_SV\_I}_2$, conjecture)

**SYO277^5.p** TPS problem THM47D
$\forall x$: \$i, $y$: \$i: ($\forall$xq: \$i $\to$ \$o: ((xq@$x$) $\Rightarrow$ (xq@$y$)) $\iff$ $\forall r$: \$i $\to$ \$i $\to$ \$o: ($\forall z$: \$i: ($r$@$z$@$z$) $\Rightarrow$ ($r$@$x$@$y$)))  thf(cTHM47D,

**SYO278^5.p** TPS problem from BASIC-HO-THMS
$a$: \$tType  thf(a_type, type)
$q$: \$o  thf($q$, type)
$r$: (($a \to \$o$) $\to$ \$o) $\to$ \$o  thf($r$, type)

$\forall$xp: ($a \to$ \$o) $\to$ \$o: ($r$@xp) $\Rightarrow$ $q$ thf(cPRIMQWFF, conjecture)

**SYO279^5.p** TPS problem from BASIC-HO-THMS
cLAM: (\$i $\to$ \$i) $\to$ \$i thf(cLAM, type)
cAPP: \$i $\to$ \$i $\to$ \$i thf(cAPP, type)
cReduct: \$i $\to$ \$i $\to$ \$o thf(cReduct, type)
$\forall$xx: \$i $\to$ \$i, xy: \$i: (cReduct@(cAPP@(cLAM@xx)@xy)@(xx@xy)) thf(cBETA_CONVERSION, conjecture)

**SYO280^5.p** TPS problem from BASIC-HO-THMS
$s$: \$i $\to$ \$i thf($s$, type)
$\exists a$: \$i $\to$ \$o: $\forall$xx: \$i: (($a$@xx) $\iff$ $\neg$ $a$@($s$@xx)) thf(cBLEDSOE_FENG_SV_EO$_1$, conjecture)

**SYO281^5.p** TPS problem from BASIC-HO-THMS
$\forall$xp: \$i $\to$ \$o: $\exists$xq: \$i $\to$ \$o: $\forall$xx: \$i: ((xp@xx) $\Rightarrow$ (xq@xx)) thf(cTRIV$_3$, conjecture)

**SYO282^5.p** TPS problem from BASIC-HO-THMS
$b$: \$tType thf(b_type, type)
$\forall$xx: $b \to$ \$o: $\exists$xy: $b$: ($\exists$xx$_0$: $b$: (xx@xx$_0$) $\Rightarrow$ (xx@xy)) thf(cL$_{51}$, conjecture)

**SYO284^5.p** TPS problem from BASIC-HO-THMS
$r$: \$i $\to$ \$i $\to$ \$o thf($r$, type)
$\forall$xp: \$i $\to$ \$o, xy: \$i: ((xp@xy) $\Rightarrow$ $\exists$xx: \$i: ($r$@xx@xy)) thf(cTRIV$_1$, conjecture)

**SYO285^5.p** TPS problem from BASIC-HO-THMS
$y$: \$i thf($y$, type)
cQ: \$i $\to$ \$o thf(cQ, type)
cR: \$i $\to$ \$o thf(cR, type)
$\forall$xp: \$i $\to$ \$o: (xp@$y$) $\Rightarrow$ ($\forall$xx: \$i: (cR@xx) and cQ@$y$) thf(cTEST$_2$, conjecture)

**SYO286^5.p** TPS problem from BASIC-HO-THMS
$y$: \$i thf($y$, type)
cQ: \$i $\to$ \$o thf(cQ, type)
cR: \$i $\to$ \$o thf(cR, type)
$\forall$xp: \$i $\to$ \$o: (xp@$y$) $\Rightarrow$ ($\exists$xx: \$i: (cR@xx) $\Rightarrow$ (cQ@$y$)) thf(cTEST$_1$, conjecture)

**SYO287^5.p** TPS problem from BASIC-HO-THMS
cB: \$i $\to$ \$i $\to$ \$o thf(cB, type)
cA: \$i $\to$ \$o thf(cA, type)
$c_0$: \$i thf($c_0$, type)
$\exists$xv: \$i $\to$ \$i $\to$ \$o: $\forall$xx: \$i: ((xv@xx@$c_0$) $\iff$ (cA@xx or cB@xx@xx)) thf(cSV$_9$, conjecture)

**SYO288^5.p** TPS problem from BASIC-HO-THMS
cB: \$i $\to$ \$i $\to$ \$o thf(cB, type)
cA: \$i $\to$ \$o thf(cA, type)
$c_0$: \$i thf($c_0$, type)
$\exists$xv: \$i $\to$ \$i $\to$ \$o: $\forall$xx: \$i: ((xv@xx@$c_0$) $\iff$ (cA@xx and cB@xx@xx)) thf(cSV$_{10}$, conjecture)

**SYO289^5.p** TPS problem from BASIC-HO-THMS
$\forall$xr: \$i $\to$ \$i $\to$ \$o, xy: \$i: ($\forall$xp: \$i $\to$ \$o: (xp@xy) $\Rightarrow$ $\exists$xx: \$i: (xr@xx@xy)) thf(cTRIV$_2$, conjecture)

**SYO290^5.p** TPS problem from BASIC-HO-THMS
$a$: \$tType thf(a_type, type)
$g_2$: $a \to a$ thf($g_2$, type)
$g_1$: $a \to a$ thf($g_1$, type)
$p$: ($a \to a$) $\to$ \$o thf($p$, type)
$\neg$ $p$@$\lambda$xw: $a$: ($g_1$@($g_2$@xw)) or $p$@$\lambda$xx: $a$: ($g_1$@($g_2$@xx)) thf(cTRANS_BUG_EX$_2$, conjecture)

**SYO291^5.p** TPS problem from BASIC-HO-THMS
$y$: \$i thf($y$, type)
cQ: \$i $\to$ \$o thf(cQ, type)
$x$: \$i thf($x$, type)
$f$: \$i $\to$ \$i thf($f$, type)
cR: \$i $\to$ \$o thf(cR, type)
$\forall$xp: \$i $\to$ \$o: (xp@$y$) $\Rightarrow$ (cR@$x$ and cR@($f$@$x$) and cQ@$y$) thf(cTEST$_3$, conjecture)

**SYO292^5.p** TPS problem from BASIC-HO-THMS
cP: \$i $\to$ \$i $\to$ \$o thf(cP, type)

$\exists a$: \$i → \$o: ∀xx: \$i, xy: \$i: ((a@xx or a@xy) ⇒ (cP@xx@xy)) thf(cBLEDSOE5E, conjecture)

**SYO293^5.p** TPS problem from BASIC-HO-THMS
cP: \$i → \$i → \$o thf(cP, type)
$\exists a$: \$i → \$o: ∀xx: \$i, xy: \$i: ((a@xx and a@xy) ⇒ (cP@xx@xy)) thf(cBLEDSOE5A, conjecture)

**SYO294^5.p** TPS problem from BASIC-HO-THMS
cN: (\$i → \$o) → \$o thf(cN, type)
cS: ((\$i → \$o) → \$o) → (\$i → \$o) → \$o thf(cS, type)
$c_0$: (\$i → \$o) → \$o thf($c_0$, type)
∀p: ((\$i → \$o) → \$o) → \$o: ((p@$c_0$ and ∀x: (\$i → \$o) → \$o: ((p@x) ⇒ (p@(cS@x)))) ⇒ (p@cN)) thf(cNATN$_1$, conjectu

**SYO295^5.p** TPS problem from BASIC-HO-THMS
b: \$i thf(b, type)
y: \$i thf(y, type)
a: \$i thf(a, type)
x: \$i thf(x, type)
x ≠ y ⇒ ∃xf: \$i → \$i: ((xf@x) = a and (xf@y) = b) thf(cX$_{5311}$, conjecture)

**SYO296^5.p** TPS problem from BASIC-HO-THMS
q: \$i → \$o thf(q, type)
p: \$i → \$o thf(p, type)
$\exists a$: \$i → \$o: ∀xx: \$i, xy: \$i: ((a@xx or a@xy) ⇒ (p@xx and q@xy)) thf(cBLEDSOE5D, conjecture)

**SYO297^5.p** TPS problem from BASIC-HO-THMS
n: \$tType thf(n_type, type)
cS: n → n thf(cS, type)
$c_0$: n thf($c_0$, type)
∀xp: n → \$o: ((xp@$c_0$ and ∀xx: n: ((xp@xx) ⇒ (xp@(cS@xx)))) ⇒ ∀xx: n: (xp@xx)) thf(cPA_IND, conjecture)

**SYO298^5.p** TPS problem from BASIC-HO-THMS
q: \$i → \$i → \$o thf(q, type)
p: \$i → \$i → \$o thf(p, type)
$\exists a$: \$i → \$o: ∀l: \$i: ∃xy: \$i: ∀xz: \$i: ((a@xz) ⇒ (p@xz@xy and q@l@xy)) thf(cBLEDSOE5B, conjecture)

**SYO299^5.p** TPS problem from BASIC-HO-THMS
∀p: \$o, q: \$o, r: \$o: ∃s: \$o: (((p ⟺ q) ⟺ r) ⇒ (p ⟺ (q ⟺ s))) thf(cTHM$_{51}$, conjecture)

**SYO300^5.p** TPS problem from BASIC-HO-THMS
∀p: ((\$i → \$i) → \$i) → ((\$i → \$i) → \$i) → \$o: ∃x: (\$i → \$i) → \$i: (∀xz: (\$i → \$i) → \$i: (p@xz@xz) ⇒ (p@λu: \$i → \$i: (u@(x@λv: \$i: v))@x)) thf(cUNIFTHM$_1$, conjecture)

**SYO301^5.p** TPS problem from BASIC-HO-THMS
f: \$i → \$i thf(f, type)
cP: \$i → \$o thf(cP, type)
b: \$i thf(b, type)
(cP@(f@b)) ⇒ ∃xs: \$i, a: \$i → \$o: (∀xx: \$i: ((a@xx) ⇒ (cP@xx)) and a@(f@xs)) thf(cBLEDSOE$_5$, conjecture)

**SYO302^5.p** TPS problem from BASIC-HO-THMS
c: \$i thf(c, type)
b: \$i thf(b, type)
a: \$i thf(a, type)
c_less_: \$i → \$i → \$o thf(c_less_, type)
(c_less_@a@b and c_less_@b@c) ⇒ ∃a: \$i → \$o: (¬ a@a and a@b and ¬ a@c) thf(cBLEDSOE$_4$, conjecture)

**SYO303^5.p** TPS problem from BASIC-HO-THMS
b: \$i thf(b, type)
cS: \$i → \$o thf(cS, type)
a: \$i thf(a, type)
cT: \$i → \$o thf(cT, type)
$c_0$: \$i thf($c_0$, type)
∀p: \$i → \$o: (¬ p@$c_0$ or ∀xx: \$i: (p@xx)) ⇒ (¬ cS@$c_0$ and cT@$c_0$ or (cT@a and cS@b)) thf(cMIN_QUAN_BUG, conjectu

**SYO304^5.p** TPS problem from UNKNOWN
a: \$tType thf(a_type, type)
∀xq: (a → a → \$o) → \$o: ((xq@λx: a, y: a: ∀xq$_0$: a → \$o: ((xq$_0$@x) ⇒ (xq$_0$@y))) ⇒ (xq@λx: a, y: a: x = y)) thf(cE2_eq_-pme, conjecture)

**SYO305^5.p** TPS problem from BASIC-HO-THMS
cB: $i → $o  thf(cB, type)
cA: $i → $o  thf(cA, type)
∀$z_1$: $i: ((cA@$z_1$) ⇒ (cB@$z_1$)) ⇒ ∀$z_1$: $i → $o: (∀$z_3$: $i: (($z_1$@$z_3$) ⇒ (cA@$z_3$)) ⇒ ∀$z_3$: $i: (($z_1$@$z_3$) ⇒ (cB@$z_3$)))  thf(cSET79_pme, conjecture)

**SYO306^5.p** TPS problem from BASIC-HO-THMS
cT: $i → $o  thf(cT, type)
cS: $i → $o  thf(cS, type)
∀$p$: $i → $o: (∀xx: $i: ($p$@xx) ⇒ ∀xx: $i: ($p$@xx)) ⇒ (∀xx: $i: (cS@xx and cT@xx) ⇒ ∀xx: $i: (cS@xx and cT@xx))  thf

**SYO307^5.p** TPS problem from BASIC-HO-THMS
cT: $i → $o  thf(cT, type)
$q$: $i → $o  thf($q$, type)
cR: $i → $o  thf(cR, type)
$p$: $i → $o  thf($p$, type)
∃$a$: $i → $o: ∀xx: $i, xy: $i, xz: $i: (($a$@xx or ($a$@xy and $a$@xz)) ⇒ (($p$@xx and cR@xy) or ($q$@xx and cT@xz)))  thf(cBL

**SYO308^5.p** TPS problem from BASIC-HO-THMS
cB: $i → $o  thf(cB, type)
cA: $i → $o  thf(cA, type)
∀$z_1$: $i → $o: ((∀$z_3$: $i: (($z_1$@$z_3$) ⇒ (cA@$z_3$)) or ∀$z_4$: $i: (($z_1$@$z_4$) ⇒ (cB@$z_4$))) ⇒ ∀$z_5$: $i: (($z_1$@$z_5$) ⇒ (cA@$z_5$ or cB@$z_5$)))  thf(cSET81_pme, conjecture)

**SYO309^5.p** TPS problem from BASIC-HO-THMS
cS: $i → $i  thf(cS, type)
cQ: $i → $i  thf(cQ, type)
cR: $i → $i → $o  thf(cR, type)
∀xx: $i: (∃xu: $i: (cR@xx@(cQ@xu)) ⟺ ¬ ∃xv: $i: (cR@(cS@xx)@(cQ@xv))) ⇒ ∃$a$: $i → $o: ∀xx: $i: (($a$@xx) ⟺ ¬ $a$@(cS@xx))  thf($cEO_1$, conjecture)

**SYO310^5.p** TPS problem from BASIC-HO-THMS
∃xop: $o → $o → $o: (xop@$true@$true and xop@$false@$false and ¬ xop@$false@$true and ¬ xop@$true@$false) and ∀xm
$o: ((xm@$true) ⟺ (xm@($true ⇒ $true)))  thf(cOMEGA_EXAMPLE, conjecture)

**SYO311^5.p** TPS problem from BASIC-HO-THMS
∃xop: $o → $o → $o: (xop@$true@$true and ¬ xop@$false@$false and ¬ xop@$false@$true and ¬ xop@$true@$false) and ∀x
$o: ((xm@$true) ⟺ (xm@($true ⇒ $true)))  thf($cOMEGA\_EXAMPLE_2$, conjecture)

**SYO312^5.p** TPS problem from BASIC-HO-THMS
$cE_2$: ($i → $o) → ($i → $o) → $o  thf($cE_2$, type)
$cE_1$: $i → $i → $o  thf($cE_1$, type)
¬ ∃xh: ($i → $o) → $i: (∀xx: $i: ($cE_1$@xx@xx) and ∀xp: $i → $o, xq: $i → $o: (($cE_2$@xp@xq) ⇒ ((xp@(xh@xp)) ⟺ (xq@(xh@xq)))) and ∀xp: $i → $o, xq: $i → $o: (($cE_1$@(xh@xp)@(xh@xq)) ⇒ ($cE_2$@xp@xq)))  thf($cTHM_{118}$, conjecture)

**SYO313^5.p** TPS problem from BASIC-HO-THMS
cELESS: $i → $i → $o  thf(cELESS, type)
∀$a$: $i → $o: ((∃xr: $i: ($a$@xr) and ∃xu: $i: ∀xx: $i: (($a$@xx) ⇒ (cELESS@xx@xu))) ⇒ ∃xl: $i: (∀xx: $i: (($a$@xx) ⇒ (cELESS@xx@xl)) and ∀xy: $i: (∀xx: $i: (($a$@xx) ⇒ (cELESS@xx@xy)) ⇒ (cELESS@xl@xy))))  thf(cELUB, conjecture

**SYO314^5.p** TPS problem from BASIC-HO-THMS
$z$: $i  thf($z$, type)
∃xp: $i → $o, xq: $i → $o, xx: $i, xy: $i: (xp@xx and ¬ xp@xy and xq@xy and ¬ xq@$z$) ⟺ ∃xp: $i → $o, xq: $i → $o, xx: $i, xy: $i: (¬ xq@$z$ and xq@xy and xp@xx and ¬ xp@xy)  thf($cSILLYWFF_2$, conjecture)

**SYO315^5.p** TPS problem from BASIC-HO-THMS
$z$: $i  thf($z$, type)
∃xp: $i → $o, xq: $i → $o, xx: $i, xy: $i: (xp@xx and ¬ xp@xy and xq@xy and ¬ xq@$z$) ⇒ ∃xp: $i → $o, xq: $i → $o, xx: $i, xy: $i: (¬ xq@$z$ and xq@xy and xp@xx and ¬ xp@xy)  thf(cSILLYWFF, conjecture)

**SYO316^5.p** TPS problem from BASIC-HO-THMS
$c_0$: $i  thf($c_0$, type)
cDOUBLE: $i → $i → $o  thf(cDOUBLE, type)
cHALF: $i → $i → $o  thf(cHALF, type)
cS: $i → $i  thf(cS, type)

∀xx: $i, xy: $i: ((cDOUBLE@xx@xy) ⇒ (cDOUBLE@(cS@xx)@(cS@(cS@xy)))) ⇒ ((∀xu: $i, xv: $i: (cHALF@xu@xv) and
$i → $i → $o: (∀xz: $i: (xp@$c_0$@$c_0$@xz) ⇒ ∀xz: $i: (xp@xu@xv@xz))) ⇒ ¬ cDOUBLE@$c_0$@$c_0$)  thf(cTHM300_BUG, con

**SYO317^5.p** TPS problem from BASIC-HO-THMS
cP: $i → $o  thf(cP, type)
$f$: $i → $i  thf($f$, type)
cEQ: $i → $i → $o  thf(cEQ, type)
$a$: $i  thf($a$, type)
(∀xx: $i: (cEQ@xx@xx) and ∀xx: $i, xy: $i: ((cEQ@xx@xy and cP@xx) ⇒ (cP@xy)) and cP@$a$ and ∀xy: $i, xz: $i: ((cEQ@(
(cEQ@xy@xz))) ⇒ ∃$a$: $i → $o: (∀xx: $i: (($a$@($f$@xx)) ⇒ (cP@xx)) and ∃xz: $i: ($a$@xz))  thf(cTHM$_{304}$, conjecture)

**SYO318^5.p** TPS problem from BASIC-HO-THMS
$c_0$: $i  thf($c_0$, type)
$c_2$: $i  thf($c_2$, type)
c_star: $i → $i → $i  thf(c_star, type)
c_less_: $i → $i → $o  thf(c_less_, type)
div: $i → $i → $i  thf(div, type)
(¬ c_less_@$c_0$@$c_0$ and ¬ c_less_@(div@$c_0$@$c_2$)@$c_0$ and ¬ c_less_@(c_star@$c_2$@$c_0$)@$c_0$) ⇒ ∃$a$: $i → $o: (∀xx: $i, xy: $i: (($a$@xx a
(¬ c_less_@(div@xx@$c_2$)@$c_0$ and ¬ c_less_@xy@(div@xx@$c_2$) and ¬ c_less_@(c_star@$c_2$@xx)@xy)) and $a$@$c_0$)  thf(cBLEDS

**SYO323^5.p** TPS problem from BASIC-HO-THMS
cS: $i → $i  thf(cS, type)
cHALF: $i → $i → $o  thf(cHALF, type)
$c_0$: $i  thf($c_0$, type)
cDOUBLE: $i → $i → $o  thf(cDOUBLE, type)
∀$q$: $i → $i → $o, xu: $i, xv: $i: ((cDOUBLE@xu@xv and $q$@$c_0$@$c_0$ and ∀xx: $i, xy: $i: (($q$@xx@xy) ⇒ ($q$@(cS@xx)@(cS@(cS
($q$@xu@xv)) and cHALF@$c_0$@$c_0$ and cHALF@$c_0$@(cS@$c_0$) and ∀xx: $i, xy: $i: ((cHALF@xx@xy) ⇒ (cHALF@(cS@(cS@xx)

**SYO324^5.p** TPS problem from BASIC-HO-THMS
∀xh: ($i → $o) → $i: (∃xp: $i → $o, xq: $i → $o: (∀xq$_{31}$: $i → $o: (¬ xq$_{31}$@(xh@xp) or xq$_{31}$@(xh@xq)) and ∃xx: $i: ¬ (xp@xx
(xq@xx)) or ∀xt: $i → $o: (xt@(xh@xt) or ∃xq: $i → $o: (xq@(xh@λxz: $i: ∃xt$_0$: $i → $o: (¬ xt$_0$@(xh@xt$_0$) and ∀xq$_0$: $i →
$o: (¬ xq$_0$@xz or xq$_0$@(xh@xt$_0$)))) and ¬ xq@(xh@xt))))  thf(cTHM143_EXPANDB, conjecture)

**SYO325^5.p** TPS problem from BASIC-HO-THMS
$a$: $tType  thf(a_type, type)
cK: ($a$ → $o) → $a$ → $o  thf(cK, type)
∀$x$: $a$ → $o, $y$: $a$ → $o: (∀xx: $a$: (($x$@xx) ⇒ ($y$@xx)) ⇒ ∀xx: $a$: ((cK@$x$@xx) ⇒ (cK@$y$@xx))) ⇒
∀xx: $a$: ((cK@λxx$_0$: $a$: ∃$s$: $a$ → $o: (∀xx$_1$: $a$: (($s$@xx$_1$) ⇒ (cK@$s$@xx$_1$)) and $s$@xx$_0$)@xx) ⇒ (cK@(cK@λxx$_0$: $a$: ∃$s$: $a$ →
$o: (∀xx$_1$: $a$: (($s$@xx$_1$) ⇒ (cK@$s$@xx$_1$)) and $s$@xx$_0$))@xx))  thf(cTHM116_1SS, conjecture)

**SYO326^5.p** TPS problem from BASIC-HO-THMS
cC: $i → $o  thf(cC, type)
$f$: $i → $i  thf($f$, type)
cB: $i → $i → $o  thf(cB, type)
cA: $i → $o  thf(cA, type)
∃xu: $i → $i → $o: (∀xw: $i, xz: $i: ((cA@xw and cB@xz@xw) ⇒ (xu@($f$@xw)@xz)) and ∀xz: $i: ((cC@xz) ⇒
(xu@xz@xz)) and ∀xv: $i → $i → $o: ((∀xw: $i, xz: $i: ((cA@xw and cB@xz@xw) ⇒ (xv@($f$@xw)@xz)) and ∀xz: $i: ((cC@x
(xv@xz@xz))) ⇒ ∀xx: $i, xy: $i: ((xu@xx@xy) ⇒ (xv@xx@xy))))  thf(cSV$_8$, conjecture)

**SYO327^5.p** TPS problem from BASIC-HO-THMS
cHALF: $i → $i → $o  thf(cHALF, type)
cDOUBLE: $i → $i → $o  thf(cDOUBLE, type)
cS: $i → $i  thf(cS, type)
$c_0$: $i  thf($c_0$, type)
(∀$q$: $i → $i → $o, xu: $i, xv: $i: ((cDOUBLE@xu@xv and $q$@$c_0$@$c_0$ and ∀xx: $i, xy: $i: (($q$@xx@xy) ⇒ ($q$@(cS@xx)@(cS@(c
($q$@xu@xv)) and cHALF@$c_0$@$c_0$ and cHALF@$c_0$@(cS@$c_0$) and ∀xx: $i, xy: $i: ((cHALF@xx@xy) ⇒ (cHALF@(cS@(cS@xx)
∀xu: $i, xv: $i: ((cDOUBLE@xu@xv) ⇒ (cHALF@xv@xu))  thf(cDOUBLE_TO_HALF$_6$, conjecture)

**SYO328^5.p** TPS problem from BASIC-HO-THMS
$a$: $tType  thf(a_type, type)
cG2$_0$: $a$ → $a$  thf(cG2$_0$, type)
cG1$_0$: $a$ → $a$  thf(cG1$_0$, type)
cP$_0$: ($a$ → $a$) → $o  thf(cP$_0$, type)
$j_7$: $a$ → $a$  thf($j_7$, type)

$cF_0$: $a \to a$ thf($cF_0$, type)
$j_6$: $a \to a$ thf($j_6$, type)
$p_6$: $(a \to a) \to \$o$ thf($p_6$, type)
$cJ_1$: $a \to a$ thf($cJ_1$, type)
$p_4$: $(a \to a) \to \$o$ thf($p_4$, type)
$cJ_0$: $a \to a$ thf($cJ_0$, type)
$(((p_4@\lambda xu_3$: $a$: $xu_3$ and $((p_4@cJ_0) \Rightarrow (p_4@\lambda xx_4$: $a$: $(cF_0@(cJ_0@xx_4))))) \Rightarrow (p_4@cG1_0))$ and $((p_6@\lambda xu_4$: $a$: $xu_4$ and $((p_6@cJ$
$(p_6@\lambda xx_5$: $a$: $(cF_0@(cJ_1@xx_5))))) \Rightarrow (p_6@\lambda xx$: $a$: $(cG2_0@xx)))) \Rightarrow ((cP_0@\lambda xu_5$: $a$: $xu_5$ and $((cP_0@j_6) \Rightarrow$
$(cP_0@\lambda xx_7$: $a$: $(cF_0@(j_6@xx_7)))))$ and $((cP_0@j_7) \Rightarrow (cP_0@\lambda xx_7$: $a$: $(cF_0@(j_7@xx_7)))))) \Rightarrow (cP_0@\lambda xx_6$: $a$: $(cG1_0@(cG2_0@xx_6$

**SYO329^5.p** TPS problem from BASIC-HO-THMS
cS: $\$i \to \$i$ thf(cS, type)
cDOUBLE: $\$i \to \$i \to \$o$ thf(cDOUBLE, type)
cHALF: $\$i \to \$i \to \$o$ thf(cHALF, type)
$c_0$: $\$i$ thf($c_0$, type)
(∀xu: $i, xv: $i: ((cHALF@xu@xv) ⇒ ∀$q$: $i → $i → $o: (($q@$c_0@$c_0 and $q@(cS@$c_0)@$c_0 and ∀xx: $i, xy: $i: (($q@xx@xy) ⇒
$(q@(cS@(cS@xx))@(cS@xy)))) \Rightarrow (q@xu@xv)))$ and cDOUBLE@$c_0@c_0$ and ∀xx: $i, xy: $i: ((cDOUBLE@xx@xy) ⇒
(cDOUBLE@(cS@xx)@(cS@(cS@xy))))) ⇒ ∀xu: $i, xv: $i: ((cHALF@xu@xv) ⇒ (cDOUBLE@xv@xu or cDOUBLE@(cS@

**SYO330^5.p** TPS problem from BASIC-HO-THMS
cNUMBER: $\$i \to \$o$ thf(cNUMBER, type)
cODD: $\$i \to \$o$ thf(cODD, type)
cEVEN: $\$i \to \$o$ thf(cEVEN, type)
cS: $\$i \to \$i$ thf(cS, type)
$c_0$: $\$i$ thf($c_0$, type)
(cEVEN@$c_0$ and ∀xn: $i: ((cEVEN@xn) ⇒ (cEVEN@(cS@(cS@xn)))) and cODD@(cS@$c_0$) and ∀xn: $i: ((cODD@xn) ⇒
(cODD@(cS@(cS@xn)))) and ∀$p$: $i → $o, $q$: $i → $o: (($p@$c_0$ and $q@c_0$ and ∀xx: $i: (($p@xx and $q@xx) ⇒ ($p@(cS@xx) and
∀xx: $i: ($p@xx and $q@xx)) and ∀xn: $i: ((cNUMBER@xn) ⟺ (cEVEN@xn or cODD@xn))) ⇒ ∀xn: $i: (cNUMBER@xn)

**SYO331^5.p** TPS problem from BASIC-HO-THMS
$a$: $\$tType$ thf(a_type, type)
cK: $(a \to \$o) \to a \to \$o$ thf(cK, type)
$\forall x$: $a \to \$o$: (∀xx: $a$: (($x@xx) ⇒ ∃$s$: $a \to \$o$: (∀$xx_0$: $a$: (($s@xx_0) ⇒ (cK@$s@xx_0$)) and $s@xx)) ⇒ ∀xx: $a$: ((cK@$x@xx) ⇒
(cK@$\lambda xx_0$: $a$: ∃$s$: $a \to \$o$: (∀$xx_1$: $a$: (($s@xx_1) ⇒ (cK@$s@xx_1$)) and $s@xx_0$)@xx))) ⇒ ∀xx: $a$: (∃$s$: $a \to$
$o: (∀$xx_0$: $a$: (($s@xx_0) ⇒ (cK@$s@xx_0$)) and $s@xx) ⇒ (cK@$\lambda xx_0$: $a$: ∃$s$: $a \to \$o$: (∀$xx_1$: $a$: (($s@xx_1) ⇒
(cK@$s@xx_1$)) and $s@xx_0$)@xx)) thf(cTHM116_2SS_pme, conjecture)

**SYO332^5.p** TPS problem from BASIC-HO-THMS
$b$: $\$tType$ thf(b_type, type)
$a$: $\$tType$ thf(a_type, type)
(∀xs: $(b \to \$o) \to \$o$: (∀$x$: $b \to \$o$: ((xs@$x) ⇒ ∃xy: $b$: ($x@xy)) ⇒ ∃xf: $(b \to \$o) \to b$: ∀$x$: $b \to \$o$: ((xs@$x) ⇒
$(x@(xf@x)))) \Rightarrow ∀xr: a \to b \to \$o$: ∃xg: $a \to b$: ∀xx: $a$: (∃xy: $b$: (xr@xx@xy) ⇒ (xr@xx@(xg@xx)))) and (∀xr: $(a \to$
$o) \to a \to \$o$: ∃xg: $(a \to \$o) \to a$: ∀xx: $a \to \$o$: (∃xy: $a$: (xr@xx@xy) ⇒ (xr@xx@(xg@xx))) ⇒ ∀xs: $(a \to$
$o) \to \$o$: (∀$x$: $a \to \$o$: ((xs@$x) ⇒ ∃xt: $a$: ($x@xt)) ⇒ ∃xf: $(a \to \$o) \to a$: ∀$x$: $a \to \$o$: ((xs@$x) ⇒
$(x@(xf@x)))))$ thf($cTHM_{561}$, conjecture)

**SYO333^5.p** TPS problem from BASIC-HO-THMS
$u$: $\$i$ thf($u$, type)
$v$: $\$i$ thf($v$, type)
cDOUBLE: $\$i \to \$i \to \$o$ thf(cDOUBLE, type)
cHALF: $\$i \to \$i \to \$o$ thf(cHALF, type)
cS: $\$i \to \$i$ thf(cS, type)
$c_0$: $\$i$ thf($c_0$, type)
cSx: $\$i$ thf(cSx, type)
(cDOUBLE@$c_0@c_0$ and ∀xx: $i, xy: $i: ((cDOUBLE@xx@xy) ⇒ (cDOUBLE@cSx@(cS@(cS@xy)))) and cHALF@$c_0@c_0$ and
(cHALF@(cS@xx)@(cS@(cS@xy)))) and ∀$q$: $i → $i → $o, $xu_0$: $i, $xv_0$: $i: ((cHALF@$xu_0@xv_0$ and $q@c_0@c_0$ and $q@c_0@(cS@$
$(q@(cS@xx)@(cS@(cS@xy))))) \Rightarrow (q@xu_0@xv_0))) \Rightarrow ((cHALF@u@v) \Rightarrow (cDOUBLE@v@u))$ thf(cHALF_TO_DOUBL

**SYO334^5.p** TPS problem from BASIC-HO-THMS
$c$: $\$tType$ thf(c_type, type)
$b$: $\$tType$ thf(b_type, type)
$a$: $\$tType$ thf(a_type, type)
c_starc: $c \to c \to c$ thf(c_starc, type)

c_starb: $b \to b \to b$ thf(c_starb, type)
c_stara: $a \to a \to a$ thf(c_stara, type)
$\forall$xf: $a \to b$, xg: $a \to c$, xh: $b \to c$: (($\forall$xx: $a$, xq: $c \to$ $o: ((xq@(xh@(xf@xx))) $\Rightarrow$ (xq@(xg@xx))) and $\forall$xy: $b$: $\exists$xx: $a$: $\forall$xq: $b \to$
$o: ((xq@(xf@xx)) $\Rightarrow$ (xq@xy)) and $\forall$xx: $a$, xy: $a$, xq: $b \to$ $o: ((xq@(xf@(c_stara@xx@xy))) $\Rightarrow$ (xq@(c_starb@(xf@xx)@(xf@
$o: ((xq@(xg@(c_stara@xx@xy))) $\Rightarrow$ (xq@(c_starc@(xg@xx)@(xg@xy))))) $\Rightarrow$ $\forall$xx: $b$, xy: $b$, xq: $c \to$ $o: ((xq@(xh@(c_starb@
(xq@(c_starc@(xh@xx)@(xh@xy))))) thf(cTHM270_INST, conjecture)

**SYO335^5.p** TPS problem from BASIC-HO-THMS
cS: $i $\to$ $i thf(cS, type)
cDOUBLE: $i $\to$ $i $\to$ $o thf(cDOUBLE, type)
cHALF: $i $\to$ $i $\to$ $o thf(cHALF, type)
$c_0$: $i thf($c_0$, type)
($\forall$xu: $i, xv: $i: ((cHALF@xu@xv) $\Rightarrow$ $\forall q$: $i $\to$ $i $\to$ $o: (($q$@$c_0$@$c_0$ and $q$@(cS@$c_0$)@$c_0$ and $\forall$xx: $i, xy: $i: (($q$@xx@xy) $\Rightarrow$
($q$@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$ ($q$@xu@xv))) and cDOUBLE@$c_0$@$c_0$ and $\forall$xx: $i, xy: $i: ((cDOUBLE@xx@xy) $\Rightarrow$
(cDOUBLE@(cS@xx)@(cS@(cS@xy)))) and $\forall$xx: $i, xy: $i: ((cDOUBLE@xx@xy) $\Rightarrow$ (cDOUBLE@(cS@xx)@(cS@(cS@xy)))
(cDOUBLE@(cS@xx)@(cS@(cS@xy))))) $\Rightarrow$ $\forall$xu: $i, xv: $i: ((cHALF@xu@xv) $\Rightarrow$ (cDOUBLE@xv@xu or cDOUBLE@(cS@

**SYO336^5.p** TPS problem from BASIC-HO-THMS
cS: $i $\to$ $i thf(cS, type)
cDOUBLE: $i $\to$ $i $\to$ $o thf(cDOUBLE, type)
cHALF: $i $\to$ $i $\to$ $o thf(cHALF, type)
$c_0$: $i thf($c_0$, type)
(cDOUBLE@$c_0$@$c_0$ and $\forall$xx: $i, xy: $i: ((cDOUBLE@xx@xy) $\Rightarrow$ (cDOUBLE@(cS@xx)@(cS@(cS@xy)))) and $\forall$xx: $i, xy: $i:
(cDOUBLE@(cS@xx)@(cS@(cS@xy)))) and $\forall$xx: $i, xy: $i: ((cDOUBLE@xx@xy) $\Rightarrow$ (cDOUBLE@(cS@xx)@(cS@(cS@xy)))
$i $\to$ $o, xq: $i $\to$ $i $\to$ $o, xu: $i, xv: $i: ((cHALF@xu@xv and xp@$c_0$@$c_0$ and xq@$c_0$@$c_0$ and xp@(cS@$c_0$)@$c_0$ and xq@(cS@$c
(xp@(cS@(cS@xx))@(cS@xy) and xq@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$ (xp@xu@xv and xq@xu@xv))) $\Rightarrow$ $\forall$xu: $i, xv: $i: ((cH
(cDOUBLE@xv@xu or cDOUBLE@(cS@xv)@(cS@xu))) thf(cTRY$_4$, conjecture)

**SYO337^5.p** TPS problem from BASIC-HO-THMS
cS: $i $\to$ $i thf(cS, type)
cDOUBLE: $i $\to$ $i $\to$ $o thf(cDOUBLE, type)
cHALF: $i $\to$ $i $\to$ $o thf(cHALF, type)
$c_0$: $i thf($c_0$, type)
($\forall$xu: $i, xv: $i: ((cHALF@xu@xv and $\forall$xp: $i $\to$ $i $\to$ $o, xq: $i $\to$ $i $\to$ $o: (((xp@$c_0$@$c_0$ or xq@$c_0$@$c_0$) and (xp@(cS@$c_0$)@$c_0$
(xp@(cS@(cS@xx))@(cS@xy) or xq@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$ (xp@xu@xv or xq@xu@xv))) or ($\neg$ cHALF@xu@xv and
$i $\to$ $o: (($q$@$c_0$@$c_0$ and $q$@(cS@$c_0$)@$c_0$ and $\forall$xx: $i, xy: $i: (($q$@xx@xy) $\Rightarrow$ ($q$@(cS@(cS@xx))@(cS@xy)))) $\Rightarrow$
($q$@xu@xv)))) and cDOUBLE@$c_0$@$c_0$ and $\forall$xx: $i, xy: $i: ((cDOUBLE@xx@xy) $\Rightarrow$ (cDOUBLE@(cS@xx)@(cS@(cS@xy)))))
$\forall$xu: $i, xv: $i: ((cHALF@xu@xv) $\Rightarrow$ (cDOUBLE@xv@xu or cDOUBLE@(cS@xv)@(cS@xu))) thf(cTHM300A_EXPAND

**SYO338^5.p** TPS problem from BASIC-HO-THMS
$a$: $tType thf(a_type, type)
$\forall r$: $a \to a \to$ $o, $u$: ($a \to$ $o) $\to a$: ($\exists x$: $a, y$: $a, z$: $a$: (($r$@$x$@$y$ or $r$@$x$@$y$) and ($r$@$y$@$z$ or $r$@$y$@$z$) and ($\neg r$@$x$@$z$ or $\neg r$@$x$@$z$)
$o: ($\exists$xz: $a$: ((xs@xz or xs@xz) and ($\neg r$@xz@($u$@xs) or $\neg r$@xz@($u$@xs))) or $\exists$xj: $a$: ($\forall$xk: $a$: ($\neg$ xs@xk or $\neg$ xs@xk or $r$@xk@x
$a$: ($\exists$xx: $a, xy: $a: (($r$@xx@xy or $r$@xx@xy) and ($\neg r$@(xf@xx)@(xf@xy) or $\neg r$@(xf@xx)@(xf@xy))) or $\exists$xw: $a$: (($r$@xw@(xf@x

**SYO339^5.p** TPS problem from BASIC-HO-THMS
$b$: $i thf($b$, type)
$a$: $i thf($a$, type)
$\forall$xr: $i $\to$ $i $\to$ $o, xf: $i $\to$ $i, $x_0$: $i: (($\forall a$: $i $\to$ $o: (($\exists$xl: $i: ($a$@xl) and $\exists$xu: $i: $\forall$xx: $i: (($a$@xx) $\Rightarrow$
(xr@xx@xu))) $\Rightarrow$ $\exists$xl: $i: ($\forall$xx: $i: (($a$@xx) $\Rightarrow$ (xr@xx@xl)) and $\forall$xy: $i: ($\forall$xx: $i: (($a$@xx) $\Rightarrow$ (xr@xx@xy)) $\Rightarrow$
(xr@xl@xy)))) and $\forall$xx: $i: ((xr@$x_0$@(xf@xx)) $\Rightarrow$ $\exists$xt: $i: (xr@xt@xx and $\forall$xs: $i: ((xr@xt@xs and xr@xs@xx) $\Rightarrow$
(xr@$x_0$@(xf@xs))))) and $\forall$xx: $i: ((xr@(xf@xx)@$x_0$) $\Rightarrow$ $\exists$xt: $i: (xr@xx@xt and $\forall$xs: $i: ((xr@xs@xt and xr@xx@xs) $\Rightarrow$
(xr@(xf@xs)@$x_0$)))) and xr@$a$@$b$ and xr@(xf@$a$)@$x_0$ and xr@$x_0$@(xf@$b$)) $\Rightarrow$ $\exists$xx: $i: (xr@$a$@xx and xr@xx@$b$ and xr@(xf@

**SYO340^5.p** TPS problem from BASIC-HO-THMS
cG: $i $\to$ $i thf(cG, type)
cK: $i thf(cK, type)
cR: $i $\to$ $i $\to$ $o thf(cR, type)
cF: $i $\to$ $i $\to$ $i thf(cF, type)
cP: $i $\to$ $o thf(cP, type)
$\forall x$: $i, y$: $i, q$: $i $\to$ $i $\to$ $o: ($\exists q_1$: $i $\to$ $i $\to$ $o, $q_2$: $i $\to$ $i $\to$ $o: ($q_1$@(cF@$x$@(cG@$x$))@$y$ and $\forall y_0$: $i: (($\neg q_1$@$x$@$y_0$ or cP@
$\exists q_1$: $i $\to$ $i $\to$ $o: ((cP@(cF@$x$@(cG@$x$)) or $q$@(cF@$x$@(cG@$x$))@(cG@$y$)) and ($\neg$ cP@(cF@$x$@(cG@$x$)) or $q_1$@(cF@$x$@(cG

**SYO341∧5.p** TPS problem from BASIC-HO-THMS
cG: $i → $i  thf(cG, type)
cK: $i  thf(cK, type)
cR: $i → $i → $o  thf(cR, type)
cF: $i → $i → $i  thf(cF, type)
cP: $i → $o  thf(cP, type)
∀$x$: $i, $y$: $i, $q$: $i → $i → $o: (∃$q_1$: $i → $i → $o, $q_2$: $i → $i → $o: ($q_1$@(cF@$x$@(cG@$x$))@$y$ and ∀$y_0$: $i: (( ¬ $q_1$@$x$@$y_0$ or cP@
∃$q_1$: $i → $i → $o: ((cP@(cF@$x$@(cG@$y$)) or $q$@(cF@$x$@(cG@$y$))@(cG@$y$)) and ( ¬ cP@(cF@$x$@(cG@$y$)) or $q_1$@(cF@$x$@(cG@

**SYO344∧5.p** TPS problem THM618
Simple E-unification example.
cD: $i  thf(cD, type)
cQ: $i → $o  thf(cQ, type)
cC: $i  thf(cC, type)
cC ≠ cD or ¬ cQ@cC or cQ@cD  thf(cTHM$_{618}$, conjecture)

**SYO345∧5.p** TPS problem THM615
cH: $o → $i  thf(cH, type)
(cH@(cH@$true) = (cH@$false)) = (cH@$false)  thf(cTHM$_{615}$, conjecture)

**SYO346∧5.p** TPS problem THM621
Simple extensionality example.
cB: $o  thf(cB, type)
cP: $o → $o  thf(cP, type)
cA: $o  thf(cA, type)
cA ≠ cB or ¬ cP@cA or cP@cB  thf(cTHM$_{621}$, conjecture)

**SYO347∧5.p** TPS problem THM620
Simple extensionality example.
cD: $i → $o  thf(cD, type)
cR: ($i → $o) → $o  thf(cR, type)
cC: $i → $o  thf(cC, type)
cC ≠ cD or ¬ cR@cC or cR@cD  thf(cTHM$_{620}$, conjecture)

**SYO348∧5.p** TPS problem E1EXT
Example from [Ben99] p.115.
$b$: $o  thf($b$, type)
$a$: $o  thf($a$, type)
($a \iff b$) ⇒ ∀$p$: $o → $o: (($p$@$a$) ⇒ ($p$@$b$))  thf(cE1EXT, conjecture)

**SYO349∧5.p** TPS problem THM617
Simple extensionality example.
cB: $o  thf(cB, type)
cP: $o → $o  thf(cP, type)
cA: $o  thf(cA, type)
¬ cA or ¬ cB or ¬ cP@cA or cP@cB  thf(cTHM$_{617}$, conjecture)

**SYO350∧5.p** TPS problem E1FUNC
Example from [Ben99] p.115.
$g$: $i → $i  thf($g$, type)
$p$: ($i → $i) → $o  thf($p$, type)
$f$: $i → $i  thf($f$, type)
∀$x$: $i: ($f$@$x$) = ($g$@$x$) ⇒ (($p$@$f$) ⇒ ($p$@$g$))  thf(cE1FUNC, conjecture)

**SYO351∧5.p** TPS problem E6EXT
Example from [Ben99] p.116.
$a$: $tType  thf(a_type, type)
(λ$r$: $a$ → $o: ∀xx: $a$: (($r$@xx) ⇒ $false)) = (λxy: $a$ → $o: (λxx: $a$: $false) = xy)  thf(cE6EXT_pme, conjecture)

**SYO352∧5.p** TPS problem E5EXT
Nontrivial direction of functional extensionality using Leibniz equality.
$n$: $i → $i  thf($n$, type)
$m$: $i → $i  thf($m$, type)
∀$x$: $i, $p$: $i → $o: (($p$@($m$@$x$)) ⇒ ($p$@($n$@$x$))) ⇒ ∀$q$: ($i → $i) → $o: (($q$@$m$) ⇒ ($q$@$n$))  thf(cE5EXT, conjecture)

**SYO353∧5.p** TPS problem E1LEIBEQ1
Example about alternative defns of equality.
$a$: $tType  thf(a_type, type)
$v$: $a$  thf($v$, type)
$u$: $a$  thf($u$, type)
$\forall$xq: $a \to$ $o: ((xq@$u$) $\Rightarrow$ (xq@$v$)) $\Rightarrow$ $\forall q$: $a \to a \to$ $o: ($\forall z$: $a$: ($q$@$z$@$z$) $\Rightarrow$ ($q$@$u$@$v$))  thf(cE1LEIBEQ1_pme, conjecture)

**SYO354∧5.p** TPS problem E4EXT
$n$: $i $\to$ $i  thf($n$, type)
$m$: $i $\to$ $i  thf($m$, type)
$\forall x$: $i, $p$: $i $\to$ $o: (($p$@($m$@$x$)) $\Rightarrow$ ($p$@($n$@$x$))) $\Rightarrow$ $\forall q$: ($i $\to$ $i) $\to$ $o: (($q$@$\lambda x$: $i: ($m$@$x$)) $\Rightarrow$ ($q$@$\lambda x$: $i: ($n$@$x$)))  thf(cE

**SYO355∧5.p** TPS problem THM613
If there's one individual, then there's only one function.
$\forall$xa: $i, xb: $i: xa = xb $\Rightarrow$ $\forall$xf: $i $\to$ $i, xg: $i $\to$ $i: xf = xg  thf(cTHM$_{613}$, conjecture)

**SYO356∧5.p** TPS problem E1LEIBEQ2
Example from [Ben9] about alternative defns of equality.
$a$: $tType  thf(a_type, type)
$v$: $a$  thf($v$, type)
$u$: $a$  thf($u$, type)
$\forall q$: $a \to a \to$ $o: ($\forall z$: $a$: ($q$@$z$@$z$) $\Rightarrow$ ($q$@$u$@$v$)) $\Rightarrow$ $\forall$xq: $a \to$ $o: ((xq@$u$) $\Rightarrow$ (xq@$v$))  thf(cE1LEIBEQ2_pme, conjecture)

**SYO357∧5.p** TPS problem E2LEIBEQ2
Example from [Ben99] about alternative defns of equality.
atype: $tType  thf(a_type, type)
$a$: $o  thf($a$, type)
$v$: atype  thf($v$, type)
$u$: atype  thf($u$, type)
$b$: $o  thf($b$, type)
$\forall p$: atype $\to$ $o: ((($a$ or $\neg a$) and $p$@$u$) $\Rightarrow$ (($b$ or $\neg b$) and $p$@$v$)) $\Rightarrow$ $\forall$xq: atype $\to$ $o: ((xq@$u$) $\Rightarrow$ (xq@$v$))  thf(cE2LEIB

**SYO358∧5.p** TPS problem E2LEIBEQ1
Example from [Ben99] about alternative defns of equality.
atype: $tType  thf(a_type, type)
$a$: $o  thf($a$, type)
$v$: atype  thf($v$, type)
$b$: $o  thf($b$, type)
$u$: atype  thf($u$, type)
$\forall$xq: atype $\to$ $o: ((xq@$u$) $\Rightarrow$ (xq@$v$)) $\Rightarrow$ $\forall p$: atype $\to$ $o: ((($a$ or $\neg a$) and $p$@$u$) $\Rightarrow$ (($b$ or $\neg b$) and $p$@$v$))  thf(cE2LEIB

**SYO359∧5.p** TPS problem EXT1
Theorem about extensionality.
$b$: $tType  thf(b_type, type)
gtype: $tType  thf(g_type, type)
$g$: $b \to$ $o  thf($g$, type)
$h$: ($b \to$ $o) $\to$ gtype  thf($h$, type)
$f$: $b \to$ $o  thf($f$, type)
($\forall$xx: $b$: (($f$@xx) $\iff$ ($g$@xx)) $\Rightarrow$ $\forall$xq: ($b \to$ $o) $\to$ $o: ((xq@$f$) $\Rightarrow$ (xq@$g$))) $\Rightarrow$ ($\forall$xx: $b$: (($f$@xx) $\iff$ ($g$@xx)) $\Rightarrow$ ($h$@$f$) = ($h$@$g$))  thf(cEXT$_1$, conjecture)

**SYO360∧5.p** TPS problem EDEC1
A version of EDEC from [Ben99] using = instead of LeibEq.
$a$: $tType  thf(a_type, type)
$j$: $a \to a$  thf($j$, type)
$g$: ($a \to a$) $\to a \to a$  thf($g$, type)
$h$: $a \to a$  thf($h$, type)
$f$: ($a \to a$) $\to a \to a$  thf($f$, type)
($\forall x$: $a \to a, y$: $a$: ($f$@$x$@$y$) = ($g$@$x$@$y$) and $\forall z$: $a$: ($h$@$z$) = ($j$@$z$)) $\Rightarrow$ ($f$@$h$) = ($g$@$j$)  thf(cEDEC$_1$, conjecture)

**SYO361∧5.p** TPS problem THM47
Shows equivalence of two definitions of =.
$\forall x$: $i, $y$: $i: ($x = y \iff \forall r$: $i \to$ $i \to$ $o: ($\forall z$: $i: ($r$@$z$@$z$) $\Rightarrow$ ($r$@$x$@$y$)))  thf(cTHM$_{47}$, conjecture)

**SYO362∧5.p** TPS problem THM631A

If a set function preserves unions, then it is monotone.
cK: ($i → $o) → $i → $o  thf(cK, type)
∀x: $i → $o, y: $i → $o: (cK@λxz: $i: (x@xz or y@xz)) = (λxw: $i: (cK@x@xw or cK@y@xw)) ⇒ ∀x: $i → $o, y: $i → $o: (∀xx: $i: ((x@xx) ⇒ (y@xx)) ⇒ ∀xx: $i: ((cK@x@xx) ⇒ (cK@y@xx)))  thf(cTHM631A_pme, conjecture

**SYO363^5.p** TPS problem EDEC2
EDEC from [Ben99], using Primeq in the antecedent instead of Leibeq.
a: $tType  thf(a_type, type)
j: a → a  thf(j, type)
g: (a → a) → a → a  thf(g, type)
h: a → a  thf(h, type)
f: (a → a) → a → a  thf(f, type)
(∀x: a → a, y: a: (f@x@y) = (g@x@y) and ∀z: a: (h@z) = (j@z)) ⇒ ∀xq: (a → a) → $o: ((xq@(f@h)) ⇒ (xq@(g@j)))  thf(cEDEC2_pme, conjecture)

**SYO364^5.p** TPS problem EDEC
Example from [Ben99] about decomposition (using Leibniz equality).
a: $tType  thf(a_type, type)
j: a → a  thf(j, type)
g: (a → a) → a → a  thf(g, type)
h: a → a  thf(h, type)
f: (a → a) → a → a  thf(f, type)
(∀x: a → a, y: a, xq: a → $o: ((xq@(f@x@y)) ⇒ (xq@(g@x@y))) and ∀z: a, xq: a → $o: ((xq@(h@z)) ⇒ (xq@(j@z)))) ⇒ ∀xq: (a → a) → $o: ((xq@(f@h)) ⇒ (xq@(g@j)))  thf(cEDEC_pme, conjecture)

**SYO365^5.p** TPS problem from EXTENSIONALITY
cA: $o  thf(cA_type, type)
cC: $o → $o  thf(cC_type, type)
$cEXT_2$: $o  thf(cEXT2_type, type)
$cEXT\_eq_0$: $o  thf(cEXT_eq_0_type, type)
$cEXT_2$ = ((cC@cA) ⇒ (cC@¬ ¬ cA))  thf(cEXT2_def, definition)
$cEXT\_eq_0$ = (∀xp: $o, xq: $o: ((xp ⟺ xq) ⇒ xp = xq))  thf(cEXT_eq_0_def, definition)
$cEXT\_eq_0$ ⇒ $cEXT_2$  thf(cEXT2A, conjecture)

**SYO366^5.p** TPS problem from EXTENSIONALITY
cP: $o → $o  thf(cP, type)
cA: $o  thf(cA, type)
(cP@(cA ⇒ cA)) ⇒ (cP@$true)  thf(cTRIVEXT$_4$, conjecture)

**SYO367^5.p** TPS problem from EXTENSIONALITY
cA: $o  thf(cA, type)
cC: $o → $o  thf(cC, type)
(cC@cA) ⇒ (cC@¬ ¬ cA)  thf(cEXT$_2$, conjecture)

**SYO368^5.p** TPS problem from EXTENSIONALITY
b: $o  thf(b, type)
cP: $o → $o  thf(cP, type)
a: $o  thf(a, type)
((a ⟺ b) and cP@a) ⇒ (cP@b)  thf(cTRIVEXT$_1$, conjecture)

**SYO369^5.p** TPS problem from EXTENSIONALITY
cB: $o  thf(cB, type)
cA: $o  thf(cA, type)
cP: $o → $o  thf(cP, type)
(cP@(cA ⇒ cB)) ⇒ (cP@(¬ cA or cB))  thf(cTRIVEXT$_5$, conjecture)

**SYO370^5.p** TPS problem from EXTENSIONALITY
cA: $i → $o  thf(cA, type)
cP: ($i → $o) → $o  thf(cP, type)
(cP@cA) ⇒ (cP@λxx: $i: ¬ ¬ cA@xx)  thf(cTRIVEXT$_3$, conjecture)

**SYO371^5.p** TPS problem from EXTENSIONALITY
cQ: $o  thf(cQ, type)
cP: $o  thf(cP, type)
∀r: $o → $o: ((r@cP) ⇒ (r@cQ)) ⇒ (cP ⟺ cQ)  thf(cEXT_O_LEIB, conjecture)

**SYO372^5.p** TPS problem from EXTENSIONALITY
$b$: \$tType  thf(b_type, type)
gtype: \$tType  thf(g_type, type)
$g$: $b \to$ \$o  thf($g$, type)
$h$: $(b \to$ \$o$) \to$ gtype  thf($h$, type)
$f$: $b \to$ \$o  thf($f$, type)
$\forall$xx: $b$: $((f$@xx$) \iff (g$@xx$)) \Rightarrow (h@f) = (h@g)$  thf(cEXT_SET$_2$, conjecture)

**SYO373^5.p** TPS problem from EXTENSIONALITY
$b$: \$tType  thf(b_type, type)
$g$: $b \to$ \$o  thf($g$, type)
$f$: $b \to$ \$o  thf($f$, type)
$\forall$xx: $b$: $((f$@xx$) \iff (g$@xx$)) \Rightarrow \forall$xq: $(b \to$ \$o$) \to$ \$o: $(($xq@$f) \Rightarrow ($xq@$g))$  thf(cEXT_SET, conjecture)

**SYO374^5.p** TPS problem from EXTENSIONALITY
cN: \$i $\to$ \$i  thf(cN, type)
cM: \$i $\to$ \$i  thf(cM, type)
$\forall$xx: \$i, xp: \$i $\to$ \$o: ((xp@(cM@xx)) $\iff$ (xp@(cN@xx))) $\Rightarrow$ $\forall$xq: (\$i $\to$ \$i) $\to$ \$o: ((xq@cM) $\iff$ (xq@cN))  thf(cEXT_A_LEIB$_2$, conjecture)

**SYO375^5.p** TPS problem from EXTENSIONALITY
$\forall x$: \$i $\to$ \$o, $y$: \$i $\to$ \$o: $(\forall w$: \$i: $((x$@$w) \iff (y$@$w)) \Rightarrow \forall$xx: \$i: $((x$@xx$) \iff (y$@xx$)))$  thf(cEXT_SET$_1$, conjecture)

**SYO376^5.p** TPS problem from EXTENSIONALITY
cG: \$o $\to$ \$o  thf(cG, type)
cF: \$o $\to$ \$o  thf(cF, type)
cP: (\$o $\to$ \$o) $\to$ \$o  thf(cP, type)
(cP@cF and cP@cG) $\Rightarrow$ (cP@$\lambda$xx: \$o: (cF@xx or cG@xx) or cP@$\lambda$xx: \$o: ($\neg$ cF@xx or cG@xx))  thf(cTHM$_{627}$, conjectu

**SYO377^5.p** TPS problem from EXTENSIONALITY
$b$: \$o  thf($b$, type)
$a$: \$o  thf($a$, type)
$\forall$xx: \$o, xy: \$o: ((xx $\iff$ xy) $\Rightarrow$ $\forall$xq: \$o $\to$ \$o: ((xq@xx) $\Rightarrow$ (xq@xy))) $\Rightarrow$ $\forall$xp: \$o $\to$ \$o: ((xp@$a$ and xp@$b$) $\Rightarrow$ (xp@($a$ and $b$)))  thf(cEXT_IMP_EMB$_2$, conjecture)

**SYO378^5.p** TPS problem from QUANTDEPTH-THMS
$c$: \$i  thf(c_type, type)
cQDP$_0$: \$i $\to$ \$o  thf(cQDP0_type, type)
cQDP$_1$: (\$i $\to$ \$o) $\to$ \$o  thf(cQDP1_type, type)
cQDP$_2$: ((\$i $\to$ \$o) $\to$ \$o) $\to$ \$o  thf(cQDP2_type, type)
cQDP$_0$ = ($\lambda$xz: \$i: xz = $c$)  thf(cQDP0_def, definition)
cQDP$_1$ = ($\lambda$xz: \$i $\to$ \$o: (xz = cQDP$_0$ and $\exists$xt: \$i: (xz@xt)))  thf(cQDP1_def, definition)
cQDP$_2$ = ($\lambda$xz: (\$i $\to$ \$o) $\to$ \$o: (xz = cQDP$_1$ and $\exists$xt: \$i $\to$ \$o: (xz@xt)))  thf(cQDP2_def, definition)
$\exists$xs: (\$i $\to$ \$o) $\to$ \$o: (cQDP$_2$@xs)  thf(cQDTHM$_2$, conjecture)

**SYO379^5.p** TPS problem from QUANTDEPTH-THMS
$c$: \$i  thf(c_type, type)
cQDP$_0$: \$i $\to$ \$o  thf(cQDP0_type, type)
cQDP$_1$: (\$i $\to$ \$o) $\to$ \$o  thf(cQDP1_type, type)
cQDP$_0$ = ($\lambda$xz: \$i: xz = $c$)  thf(cQDP0_def, definition)
cQDP$_1$ = ($\lambda$xz: \$i $\to$ \$o: (xz = cQDP$_0$ and $\exists$xt: \$i: (xz@xt)))  thf(cQDP1_def, definition)
$\exists$xs: \$i $\to$ \$o: (cQDP$_1$@xs)  thf(cQDTHM$_1$, conjecture)

**SYO380^5.p** TPS problem X-2002-12-17-B
Suggested by a student's answer on a test.
cR: \$i $\to$ \$i $\to$ \$o  thf(cR, type)
$x$: \$i  thf($x$, type)
$\exists$xy: \$i: ((cR@$x$@xy) $\Rightarrow$ $\exists$xx$_0$: \$i: (cR@xy@xx$_0$))  thf(cX_2002_12_17_B, conjecture)

**SYO381^5.p** TPS problem X-2002-12-17
Suggested by a student's answer on a test.
cR: \$i $\to$ \$i $\to$ \$o  thf(cR, type)
$\exists$xx: \$i: ($\exists$xz: \$i: $\forall$xy: \$i: (cR@xz@xy) $\iff$ $\forall$xw: \$i: (cR@xx@xw))  thf(cX_2002_12$_{17}$, conjecture)

**SYO382^5.p** TPS problem THM407

cS: $i → $o  thf(cS, type)
cQ: $i → $i → $o  thf(cQ, type)
cP: $i → $i → $o  thf(cP, type)
((∃xv: $i: ∀xx: $i: (cP@xx@xv) and ∀xx: $i: ((cS@xx) ⇒ ∃xy: $i: (cQ@xy@xx)) and ∀xx: $i, xy: $i: ((cP@xx@xy) ⇒
¬ cQ@xx@xy)) ⇒ ∃xu: $i: ¬ cS@xu) ⇒ ((∃xv: $i: ∀xx: $i: (cP@xx@xv) and ∀xx: $i: ((cS@xx) ⇒ ∃xy: $i: (cQ@xy@xx)) an
¬ cQ@xx@xy)) ⇒ ∃xu: $i: ¬ cS@xu)  thf(cTHM$_{407}$, conjecture)

**SYO383^5.p** TPS problem THM409-1
cQ$_2$: $i → $i → $i → $o  thf(cQ$_2$, type)
$f$: $i → $i  thf($f$, type)
cP$_1$: $i → $i → $o  thf(cP$_1$, type)
cQ$_1$: $i → $i → $i → $o  thf(cQ$_1$, type)
$d$: $i  thf($d$, type)
$c$: $i  thf($c$, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
¬ cQ$_1$@$a$@$b$@$c$ and cP$_1$@$a$@$a$ and cP$_1$@$b$@$b$ and cP$_1$@$c$@$c$ and ∀xx: $i: (cP$_1$@$d$@xx) and ∀xx: $i, xy: $i: (¬ cP$_1$@xx@xy or cP

**SYO384^5.p** TPS problem THM408
cD: $i → $i → $i → $o  thf(cD, type)
cF: $i → $i → $o  thf(cF, type)
cS: $i → $i → $o  thf(cS, type)
((∀xx: $i: ∃xy: $i: (cF@xx@xy) and ∃xx: $i: ∀xe: $i: ∃xn: $i: ∀xw: $i: ((cS@xn@xw) ⇒ (cD@xw@xx@xe)) and ∀xe: $i: ∃xd: $i
∀xy: $i, xz: $i: ((cF@xa@xy and cF@xb@xz) ⇒ (cD@xy@xz@xe)))) ⇒ ∃xy: $i: ∀xe: $i: ∃xm: $i: ∀xw: $i: ((cS@xm@xw) ⇒
∀xz: $i: ((cF@xw@xz) ⇒ (cD@xz@xy@xe)))) ⇒ ((∀xx: $i: ∃xy: $i: (cF@xx@xy) and ∃xx: $i: ∀xe: $i: ∃xn: $i: ∀xw: $i: ((cS@
(cD@xw@xx@xe)) and ∀xe: $i: ∃xd: $i: ∀xa: $i, xb: $i: ((cD@xa@xb@xd) ⇒ ∀xy: $i, xz: $i: ((cF@xa@xy and cF@xb@xz) ⇒
(cD@xy@xz@xe)))) ⇒ ∃xy: $i: ∀xe: $i: ∃xm: $i: ∀xw: $i: ((cS@xm@xw) ⇒ ∀xz: $i: ((cF@xw@xz) ⇒
(cD@xz@xy@xe))))  thf(cTHM$_{408}$, conjecture)

**SYO385^5.p** TPS problem THM409-2
cQ$_3$: $i → $i → $i → $o  thf(cQ$_3$, type)
$f$: $i → $i  thf($f$, type)
cP$_2$: $i → $i → $o  thf(cP$_2$, type)
cQ$_2$: $i → $i → $i → $o  thf(cQ$_2$, type)
$d$: $i  thf($d$, type)
$c$: $i  thf($c$, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
cP$_1$: $i → $i → $o  thf(cP$_1$, type)
cQ$_1$: $i → $i → $i → $o  thf(cQ$_1$, type)
¬ cQ$_1$@$a$@$b$@$c$ and cP$_1$@$a$@$a$ and cP$_1$@$b$@$b$ and cP$_1$@$c$@$c$ and ∀xx: $i: (cP$_1$@$d$@xx) and ∀xx: $i, xy: $i: (¬ cP$_1$@xx@xy or cP

**SYO386^5.p** TPS problem THM409-3
cQ$_4$: $i → $i → $i → $o  thf(cQ$_4$, type)
$f$: $i → $i  thf($f$, type)
cP$_3$: $i → $i → $o  thf(cP$_3$, type)
cQ$_3$: $i → $i → $i → $o  thf(cQ$_3$, type)
$d$: $i  thf($d$, type)
$c$: $i  thf($c$, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
cP$_2$: $i → $i → $o  thf(cP$_2$, type)
cQ$_2$: $i → $i → $i → $o  thf(cQ$_2$, type)
cP$_1$: $i → $i → $o  thf(cP$_1$, type)
cQ$_1$: $i → $i → $i → $o  thf(cQ$_1$, type)
¬ cQ$_1$@$a$@$b$@$c$ and cP$_1$@$a$@$a$ and cP$_1$@$b$@$b$ and cP$_1$@$c$@$c$ and ∀xx: $i: (cP$_1$@$d$@xx) and ∀xx: $i, xy: $i: (¬ cP$_1$@xx@xy or cP

**SYO387^5.p** TPS problem THM409-4
cQ$_5$: $i → $i → $i → $o  thf(cQ$_5$, type)
$f$: $i → $i  thf($f$, type)
cP$_4$: $i → $i → $o  thf(cP$_4$, type)
cQ$_4$: $i → $i → $i → $o  thf(cQ$_4$, type)

$d$: $i  thf($d$, type)
$c$: $i  thf($c$, type)
$b$: $i  thf($b$, type)
$a$: $i  thf($a$, type)
$cP_3$: $i → $i → $o  thf($cP_3$, type)
$cQ_3$: $i → $i → $i → $o  thf($cQ_3$, type)
$cP_2$: $i → $i → $o  thf($cP_2$, type)
$cQ_2$: $i → $i → $i → $o  thf($cQ_2$, type)
$cP_1$: $i → $i → $o  thf($cP_1$, type)
$cQ_1$: $i → $i → $i → $o  thf($cQ_1$, type)
$\neg\, cQ_1@a@b@c$ and $cP_1@a@a$ and $cP_1@b@b$ and $cP_1@c@c$ and ∀xx: $i: ($cP_1@d@$xx) and ∀xx: $i, xy: $i: ($\neg\, cP_1@xx@xy or cP

**SYO389^5.p** TPS problem from MISC
Reflexivity of constants.
$b$: $tType  thf(b_type, type)
cA: $b$ → $o  thf(cA, type)
cA = cA  thf(cEQ_THM, conjecture)

**SYO390^5.p** TPS problem UNKNOWN
∀xp: $o, xq: $o: ((xp ⟺ xq) ⇒ xp = xq)  thf($cEXT\_eq_0$, conjecture)

**SYO392^1.p** Ted Sider's modal proposition logic theorem 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mnot@(mbox_k@(mdia_k@(mbox_k@$p$))))@(mdia_k@(mbox_k@(mdia_k@(mnot@$p$)))))  thf(prove, conj

**SYO393^1.p** Ted Sider's modal proposition logic theorem 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mnot@(mdia_k@(mor@$p$@$q$)))@(mand@(mnot@(mdia_k@$p$))@(mnot@(mdia_k@$q$))))  thf(prove, conj

**SYO394^1.p** Ted Sider's modal proposition logic theorem 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_k@(mand@$p$@$q$))@(mand@(mdia_k@$p$)@(mdia_k@$q$)))  thf(prove, conjecture)

**SYO395^1.p** Ted Sider's modal proposition logic theorem 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mbox_k@(mimplies@(mnot@$p$)@$p$))@(mbox_k@$p$))  thf(prove, conjecture)

**SYO396^1.p** Ted Sider's modal proposition logic theorem 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mbox_k@(mimplies@$p$@(mnot@$p$)))@(mnot@(mdia_k@$p$)))  thf(prove, conjecture)

**SYO397^1.p** Ted Sider's modal proposition logic theorem 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_k@$p$)@(mbox_k@(mimplies@$q$@$p$)))  thf(prove, conjecture)

**SYO398^1.p** Ted Sider's modal proposition logic theorem 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)

mvalid@(mimplies@(mbox_k@(mnot@$p$))@(mbox_k@(mimplies@$p$@$q$))) thf(prove, conjecture)

**SYO399^1.p** Ted Sider's modal proposition logic theorem 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mequiv@(mnot@(mdia_k@(mand@$q$@$r$)))@(mbox_k@(mimplies@$q$@(mnot@$r$)))) thf(prove, conjecture)

**SYO400^1.p** Ted Sider's modal proposition logic theorem 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@(mimplies@$p$@$q$))@(mbox_k@(mimplies@$p$@(mnot@$q$))))@(mbox_k@(mimplies@$p$@(m

**SYO401^1.p** Ted Sider's modal proposition logic theorem 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@$p$)@(mbox_k@$q$))@(mbox_k@(mand@$p$@$q$))) thf(prove, conjecture)

**SYO402^1.p** Ted Sider's modal proposition logic theorem 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mequiv@$p$@$q$))@(mequiv@(mbox_k@$p$)@(mbox_k@$q$))) thf(prove, conjecture)

**SYO403^1.p** Ted Sider's modal proposition logic theorem 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mor@(mbox_k@$p$)@(mbox_k@$q$))@(mbox_k@(mor@$p$@$q$))) thf(prove, conjecture)

**SYO404^1.p** Ted Sider's modal proposition logic theorem 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mand@(mbox_k@(mimplies@$q$@$p$))@(mbox_k@(mimplies@(mnot@$q$)@$p$)))@(mbox_k@$p$)) thf(prove, c

**SYO405^1.p** Ted Sider's modal proposition logic theorem 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@(mimplies@$p$@$q$))@(mbox_k@(mimplies@$p$@(mnot@$q$))))@(mnot@(mdia_k@$p$))) th

**SYO406^1.p** Ted Sider's modal proposition logic theorem 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mor@$p$@$q$))@(mor@(mbox_k@$p$)@(mdia_k@$q$))) thf(prove, conjecture)

**SYO407^1.p** Ted Sider's modal proposition logic theorem 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)

mvalid@(mimplies@(mand@(mbox_k@(mimplies@$p$@$q$))@(mbox_k@(mimplies@$q$@$r$)))@(mbox_k@(mimplies@$p$@$r$))) thf(

**SYO408^1.p** Ted Sider's modal proposition logic theorem 17
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@$p$)@(mbox_k@$q$))@(mbox_k@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO409^1.p** Ted Sider's modal proposition logic theorem 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mdia_k@(mor@$p$@$q$))@(mor@(mdia_k@$p$)@(mdia_k@$q$))) thf(prove, conjecture)

**SYO410^1.p** Ted Sider's modal proposition logic theorem 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mdia_k@$p$)@(mbox_k@$q$))@(mdia_k@(mand@$p$@$q$))) thf(prove, conjecture)

**SYO411^1.p** Ted Sider's modal proposition logic theorem 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mand@(mbox_k@(mimplies@$p$@$q$))@(mdia_k@(mand@$p$@$r$)))@(mdia_k@(mand@$q$@$r$))) thf(prove, c

**SYO412^1.p** Ted Sider's modal proposition logic theorem 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mdia_k@(mimplies@$p$@$q$))@(mimplies@(mbox_k@$p$)@(mdia_k@$q$))) thf(prove, conjecture)

**SYO413^1.p** Ted Sider's modal proposition logic theorem 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_k@$p$)@(mimplies@(mbox_k@$q$)@(mdia_k@$q$))) thf(prove, conjecture)

**SYO414^1.p** Ted Sider's modal proposition logic theorem 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mdia_k@(mimplies@$p$@(mand@$q$@$r$)))@(mand@(mimplies@(mbox_k@$p$)@(mdia_k@$q$))@(mimplies@(mb

**SYO415^1.p** Ted Sider's modal proposition logic theorem 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@(mdia_k@$p$))@(mdia_k@(mbox_k@(mimplies@$p$@$q$))))@(mdia_k@(mdia_k@$q$))) thf

**SYO416^1.p** Ted Sider's modal proposition logic theorem 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_d@(mbox_d@$p$))@(mbox_d@(mdia_d@$p$))) thf(prove, conjecture)

**SYO417^1.p** Ted Sider's modal proposition logic theorem 26
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_d@(mbox_d@$p$))@(mdia_d@(mdia_d@$p$))) thf(prove, conjecture)

**SYO418^1.p** Ted Sider's modal proposition logic theorem 27
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_d@$p$)@(mdia_d@(mimplies@$q$@$p$))) thf(prove, conjecture)

**SYO419^1.p** Ted Sider's modal proposition logic theorem 28
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mnot@(mbox_d@(mand@$p$@(mnot@$p$)))) thf(prove, conjecture)

**SYO420^1.p** Ted Sider's modal proposition logic theorem 29
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_d@$p$)@(mbox_d@(mimplies@$p$@$q$)))@(mdia_d@$q$)) thf(prove, conjecture)

**SYO421^1.p** Ted Sider's modal proposition logic theorem 30
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mnot@(mand@(mbox_d@$p$)@(mbox_d@(mnot@$p$)))) thf(prove, conjecture)

**SYO422^1.p** Ted Sider's modal proposition logic theorem 31
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mdia_d@(mimplies@(mimplies@(mimplies@$p$@$q$)@$p$)@$p$)) thf(prove, conjecture)

**SYO423^1.p** Ted Sider's modal proposition logic theorem 32
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mnot@(mbox_d@(mand@(mbox_d@(mand@$p$@$q$))@(mbox_d@(mimplies@$p$@(mnot@$q$)))))) thf(prove, conjecture

**SYO424^1.p** Ted Sider's modal proposition logic theorem 33
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mor@(mor@(mdia_d@(mnot@$p$))@(mdia_d@(mnot@$q$)))@(mdia_d@(mand@$p$@$q$))) thf(prove, conjecture)

**SYO425^1.p** Ted Sider's modal proposition logic theorem 34
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_m@$p$)@(mbox_m@(mdia_m@$p$))) thf(prove, conjecture)

**SYO426^1.p** Ted Sider's modal proposition logic theorem 35
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_m@(mbox_m@$p$))@(mdia_m@(mor@$p$@$q$))) thf(prove, conjecture)

**SYO427^1.p** Ted Sider's modal proposition logic theorem 36
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_m@$p$)@(mdia_m@(mbox_m@(mimplies@$p$@$q$))))@(mdia_m@$q$)) thf(prove, conjecture)

**SYO428^1.p** Ted Sider's modal proposition logic theorem 37
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_m@(mimplies@$p$@(mbox_m@$q$)))@(mimplies@(mbox_m@$p$)@(mdia_m@$q$))) thf(prove, conjectu

**SYO429^1.p** Ted Sider's modal proposition logic theorem 38
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_b@(mbox_b@$p$))@(mbox_b@(mdia_b@$p$))) thf(prove, conjecture)

**SYO430^1.p** Ted Sider's modal proposition logic theorem 39
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_b@(mbox_b@$p$))@(mdia_b@(mbox_b@(mdia_b@(mbox_b@$p$))))) thf(prove, conjecture)

**SYO431^1.p** Ted Sider's modal proposition logic theorem 40
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mnot@(mdia_b@(mand@(mdia_b@(mbox_b@(mdia_b@$p$)))@(mbox_b@(mnot@$p$))))) thf(prove, conjecture)

**SYO432^1.p** Ted Sider's modal proposition logic theorem 41
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_b@$p$)@(mbox_b@(mdia_b@(mbox_b@(mimplies@$p$@$q$)))))@(mbox_b@$q$)) thf(prove, co

**SYO433^1.p** Ted Sider's modal proposition logic theorem 42
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mdia_$s_4$@$p$)@(mbox_$s_4$@$q$))@(mdia_$s_4$@(mand@$p$@(mbox_$s_4$@$q$)))) thf(prove, conjecture)

**SYO434^1.p** Ted Sider's modal proposition logic theorem 43
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_$s_4$@$p$)@(mbox_$s_4$@(mdia_$s_4$@(mbox_$s_4$@$p$)))) thf(prove, conjecture)

**SYO435^1.p** Ted Sider's modal proposition logic theorem 44
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mdia_$s_4$@$p$))@(mbox_$s_4$@(mdia_$s_4$@(mbox_$s_4$@(mdia_$s_4$@$p$))))) thf(prove, conjecture)

**SYO436^1.p** Ted Sider's modal proposition logic theorem 45
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mor@(mbox_$s_4$@$p$)@(mbox_$s_4$@$q$))@(mbox_$s_4$@(mor@(mbox_$s_4$@$p$)@(mbox_$s_4$@$q$)))) thf(prove, conje

**SYO437^1.p** Ted Sider's modal proposition logic theorem 46
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_s4@(mimplies@(mbox_s4@(mequiv@p@q))@r))@(mbox_s4@(mimplies@(mbox_s4@(mequiv@p@q)

**SYO438^1.p** Ted Sider's modal proposition logic theorem 47
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_s4@(mdia_s4@(mbox_s4@(mdia_s4@p))))@(mbox_s4@(mdia_s4@p))) thf(prove, conjecture)

**SYO439^1.p** Ted Sider's modal proposition logic theorem 48
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_s4@(mbox_s4@p))@(mdia_s4@(mbox_s4@(mdia_s4@(mbox_s4@p))))) thf(prove, conjecture)

**SYO440^1.p** Ted Sider's modal proposition logic theorem 49
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_s4@(mbox_s4@(mdia_s4@(mbox_s4@p))))@(mdia_s4@(mbox_s4@p))) thf(prove, conjecture)

**SYO441^1.p** Ted Sider's modal proposition logic theorem 50
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_s5@(mdia_s5@(mdia_s5@(mbox_s5@p))))@(mbox_s5@p)) thf(prove, conjecture)

**SYO442^1.p** Ted Sider's modal proposition logic theorem 51
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mbox_s5@(mdia_s5@(mdia_s5@(mbox_s5@p))))@(mbox_s5@(mbox_s5@p))) thf(prove, conjecture)

**SYO443^1.p** Ted Sider's modal proposition logic theorem 52
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mbox_s5@(mor@(mnot@p)@(mbox_s5@q)))@(mor@(mbox_s5@(mnot@p))@(mbox_s5@q))) thf(prove, c

**SYO444^1.p** Ted Sider's modal proposition logic theorem 53
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mbox_s5@(mor@(mnot@p)@(mdia_s5@q)))@(mor@(mnot@(mdia_s5@p))@(mdia_s5@q))) thf(prove, co

**SYO445^1.p** Ted Sider's modal proposition logic theorem 54
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mor@(mbox_s5@p)@(mdia_s5@q))@(mbox_s5@(mor@p@(mdia_s5@q)))) thf(prove, conjecture)

**SYO446^1.p** Ted Sider's modal proposition logic theorem 55
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mdia_s5@(mand@p@(mdia_s5@q)))@(mand@(mdia_s5@p)@(mdia_s5@q))) thf(prove, conjecture)

**SYO447^1.p** Ted Sider's modal proposition logic theorem 56
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mequiv@(mand@(mdia_s5@$p$)@(mbox_s5@$q$))@(mdia_s5@(mand@$p$@(mbox_s5@$q$)))) thf(prove, conjecture)

**SYO448^1.p** Ted Sider's modal proposition logic theorem 57
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mor@(mbox_s5@(mimplies@(mbox_s5@$p$)@(mbox_s5@$q$)))@(mbox_s5@(mimplies@(mbox_s5@$q$)@(mbox_s5@$p$))))

**SYO449^1.p** Ted Sider's modal proposition logic theorem 58
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mbox_s5@(mequiv@(mbox_s5@(mimplies@(mdia_s5@$p$)@$q$))@(mbox_s5@(mimplies@$p$@(mbox_s5@$q$))))) thf(pro

**SYO450^1.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_k@(mimplies@$p$@(mdia_k@(mimplies@$q$@$r$))))@(mdia_k@(mimplies@$q$@(mimplies@(mbox_k@$p$)@

**SYO450^2.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_d@(mimplies@$p$@(mdia_d@(mimplies@$q$@$r$))))@(mdia_d@(mimplies@$q$@(mimplies@(mbox_d@$p$)@

**SYO450^3.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_m@(mimplies@$p$@(mdia_m@(mimplies@$q$@$r$))))@(mdia_m@(mimplies@$q$@(mimplies@(mbox_m@

**SYO450^4.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_b@(mimplies@$p$@(mdia_b@(mimplies@$q$@$r$))))@(mdia_b@(mimplies@$q$@(mimplies@(mbox_b@$p$)@

**SYO450^5.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mbox_s4@(mimplies@$p$@(mdia_s4@(mimplies@$q$@$r$))))@(mdia_s4@(mimplies@$q$@(mimplies@(mbox_s4@

**SYO450^6.p** Ted Sider's propositional modal logic wff 01
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')

$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_s5@(mimplies@$p$@(mdia_s5@(mimplies@$q$@$r$))))@(mdia_s5@(mimplies@$q$@(mimplies@(mbox_s5@

**SYO451^1.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mor@$p$@(mdia_k@$q$)))@(mor@(mbox_k@$p$)@(mdia_k@$q$)))  thf(prove, conjecture)

**SYO451^2.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mor@$p$@(mdia_d@$q$)))@(mor@(mbox_d@$p$)@(mdia_d@$q$)))  thf(prove, conjecture)

**SYO451^3.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mor@$p$@(mdia_m@$q$)))@(mor@(mbox_m@$p$)@(mdia_m@$q$)))  thf(prove, conjecture)

**SYO451^4.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mor@$p$@(mdia_b@$q$)))@(mor@(mbox_b@$p$)@(mdia_b@$q$)))  thf(prove, conjecture)

**SYO451^5.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_s4@(mor@$p$@(mdia_s4@$q$)))@(mor@(mbox_s4@$p$)@(mdia_s4@$q$)))  thf(prove, conjecture)

**SYO451^6.p** Ted Sider's propositional modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_s5@(mor@$p$@(mdia_s5@$q$)))@(mor@(mbox_s5@$p$)@(mdia_s5@$q$)))  thf(prove, conjecture)

**SYO452^1.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_k@(mand@$p$@(mdia_k@$q$)))@(mimplies@(mbox_k@(mdia_k@$p$))@(mdia_k@(mbox_k@$p$))))  thf

**SYO452^2.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_d@(mand@$p$@(mdia_d@$q$)))@(mimplies@(mbox_d@(mdia_d@$p$))@(mdia_d@(mbox_d@$p$))))  thf

**SYO452^3.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)

$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_m@(mand@$p$@(mdia_m@$q$)))@(mimplies@(mbox_m@(mdia_m@$p$))@(mdia_m@(mbox_m@$p$))))

**SYO452^4.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_b@(mand@$p$@(mdia_b@$q$)))@(mimplies@(mbox_b@(mdia_b@$p$))@(mdia_b@(mbox_b@$p$))))  thf

**SYO452^5.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_$s_4$@(mand@$p$@(mdia_$s_4$@$q$)))@(mimplies@(mbox_$s_4$@(mdia_$s_4$@$p$))@(mdia_$s_4$@(mbox_$s_4$@$p$))))

**SYO452^6.p** Ted Sider's propositional modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_$s_5$@(mand@$p$@(mdia_$s_5$@$q$)))@(mimplies@(mbox_$s_5$@(mdia_$s_5$@$p$))@(mdia_$s_5$@(mbox_$s_5$@$p$))))

**SYO453^1.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mequiv@(mdia_k@$p$)@(mdia_k@$q$)))@(mbox_k@(mequiv@$p$@(mbox_k@$q$))))  thf(prove, cor

**SYO453^2.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mequiv@(mdia_d@$p$)@(mdia_d@$q$)))@(mbox_d@(mequiv@$p$@(mbox_d@$q$))))  thf(prove, cor

**SYO453^3.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mequiv@(mdia_m@$p$)@(mdia_m@$q$)))@(mbox_m@(mequiv@$p$@(mbox_m@$q$))))  thf(prove,

**SYO453^4.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mequiv@(mdia_b@$p$)@(mdia_b@$q$)))@(mbox_b@(mequiv@$p$@(mbox_b@$q$))))  thf(prove, cor

**SYO453^5.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mequiv@(mdia_$s_4$@$p$)@(mdia_$s_4$@$q$)))@(mbox_$s_4$@(mequiv@$p$@(mbox_$s_4$@$q$))))  thf(prove

**SYO453^6.p** Ted Sider's propositional modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_5$@(mequiv@(mdia_$s_5$@$p$)@(mdia_$s_5$@$q$)))@(mbox_$s_5$@(mequiv@$p$@(mbox_$s_5$@$q$))))  thf(prove

**SYO454^1.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_k@(mand@(mdia_k@$p$)@(mnot@$q$)))@(mbox_k@(mimplies@$p$@(mbox_k@$q$))))  thf(prove, conjecture

**SYO454^2.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_d@(mand@(mdia_d@$p$)@(mnot@$q$)))@(mbox_d@(mimplies@$p$@(mbox_d@$q$))))  thf(prove, conjecture

**SYO454^3.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_m@(mand@(mdia_m@$p$)@(mnot@$q$)))@(mbox_m@(mimplies@$p$@(mbox_m@$q$))))  thf(prove, conject

**SYO454^4.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_b@(mand@(mdia_b@$p$)@(mnot@$q$)))@(mbox_b@(mimplies@$p$@(mbox_b@$q$))))  thf(prove, conjecture

**SYO454^5.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_$s_4$@(mand@(mdia_$s_4$@$p$)@(mnot@$q$)))@(mbox_$s_4$@(mimplies@$p$@(mbox_$s_4$@$q$))))  thf(prove, conject

**SYO454^6.p** Ted Sider's propositional modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mdia_$s_5$@(mand@(mdia_$s_5$@$p$)@(mnot@$q$)))@(mbox_$s_5$@(mimplies@$p$@(mbox_$s_5$@$q$))))  thf(prove, conject

**SYO455^1.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_k@$p$)@(mbox_k@(mor@(mnot@$p$)@$q$)))@(mdia_k@$q$))  thf(prove, conjecture)

**SYO455^2.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_d@$p$)@(mbox_d@(mor@(mnot@$p$)@$q$)))@(mdia_d@$q$))  thf(prove, conjecture)

**SYO455^3.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_m@$p$)@(mbox_m@(mor@(mnot@$p$)@$q$)))@(mdia_m@$q$))  thf(prove, conjecture)

**SYO455^4.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')

include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_b@$p$)@(mbox_b@(mor@(mnot@$p$)@$q$)))@(mdia_b@$q$))  thf(prove, conjecture)

**SYO455^5.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_$s_4$@$p$)@(mbox_$s_4$@(mor@(mnot@$p$)@$q$)))@(mdia_$s_4$@$q$))  thf(prove, conjecture)

**SYO455^6.p** Ted Sider's propositional modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_$s_5$@$p$)@(mbox_$s_5$@(mor@(mnot@$p$)@$q$)))@(mdia_$s_5$@$q$))  thf(prove, conjecture)

**SYO456^1.p** Ted Sider's propositional modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_k@(mbox_k@(mdia_k@(mbox_k@$p$))))@(mdia_k@(mbox_k@$p$)))  thf(prove, conjecture)

**SYO456^2.p** Ted Sider's propositional modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_d@(mbox_d@(mdia_d@(mbox_d@$p$))))@(mdia_d@(mbox_d@$p$)))  thf(prove, conjecture)

**SYO456^3.p** Ted Sider's propositional modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_m@(mbox_m@(mdia_m@(mbox_m@$p$))))@(mdia_m@(mbox_m@$p$)))  thf(prove, conjecture)

**SYO456^4.p** Ted Sider's propositional modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_b@(mbox_b@(mdia_b@(mbox_b@$p$))))@(mdia_b@(mbox_b@$p$)))  thf(prove, conjecture)

**SYO456^6.p** Ted Sider's propositional modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_$s_5$@(mbox_$s_5$@(mdia_$s_5$@(mbox_$s_5$@$p$))))@(mdia_$s_5$@(mbox_$s_5$@$p$)))  thf(prove, conjecture)

**SYO457^1.p** Ted Sider's propositional modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_k@(mbox_k@$p$))@(mdia_k@(mimplies@$q$@$p$)))  thf(prove, conjecture)

**SYO457^2.p** Ted Sider's propositional modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mdia_d@(mbox_d@$p$))@(mdia_d@(mimplies@$q$@$p$)))  thf(prove, conjecture)

**SYO457^3.p** Ted Sider's propositional modal logic wff 08

include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_m@(mbox_m@$p$))@(mdia_m@(mimplies@$q$@$p$))) thf(prove, conjecture)

**SYO457^4.p** Ted Sider's propositional modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_b@(mbox_b@$p$))@(mdia_b@(mimplies@$q$@$p$))) thf(prove, conjecture)

**SYO457^5.p** Ted Sider's propositional modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_$s_4$@(mbox_$s_4$@$p$))@(mdia_$s_4$@(mimplies@$q$@$p$))) thf(prove, conjecture)

**SYO457^6.p** Ted Sider's propositional modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mdia_$s_5$@(mbox_$s_5$@$p$))@(mdia_$s_5$@(mimplies@$q$@$p$))) thf(prove, conjecture)

**SYO458^2.p** Ted Sider's propositional modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_d@$p$)@(mbox_d@$q$))@(mbox_d@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO458^3.p** Ted Sider's propositional modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_m@$p$)@(mbox_m@$q$))@(mbox_m@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO458^4.p** Ted Sider's propositional modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_b@$p$)@(mbox_b@$q$))@(mbox_b@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO458^5.p** Ted Sider's propositional modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_$s_4$@$p$)@(mbox_$s_4$@$q$))@(mbox_$s_4$@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO458^6.p** Ted Sider's propositional modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mand@(mbox_$s_5$@$p$)@(mbox_$s_5$@$q$))@(mbox_$s_5$@(mequiv@$p$@$q$))) thf(prove, conjecture)

**SYO459^1.p** Ted Sider's propositional modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')

$p$: $\i \to \$o$ thf(p_type, type)
mvalid@(mimplies@(mdia_k@(mbox_k@$p$))@(mdia_k@(mbox_k@(mdia_k@(mbox_k@$p$))))) thf(prove, conjecture)

**SYO459^2.p** Ted Sider's propositional modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $\i \to \$o$ thf(p_type, type)
mvalid@(mimplies@(mdia_d@(mbox_d@$p$))@(mdia_d@(mbox_d@(mdia_d@(mbox_d@$p$))))) thf(prove, conjecture)

**SYO459^3.p** Ted Sider's propositional modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $\i \to \$o$ thf(p_type, type)
mvalid@(mimplies@(mdia_m@(mbox_m@$p$))@(mdia_m@(mbox_m@(mdia_m@(mbox_m@$p$))))) thf(prove, conjecture)

**SYO459^4.p** Ted Sider's propositional modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $\i \to \$o$ thf(p_type, type)
mvalid@(mimplies@(mdia_b@(mbox_b@$p$))@(mdia_b@(mbox_b@(mdia_b@(mbox_b@$p$))))) thf(prove, conjecture)

**SYO459^6.p** Ted Sider's propositional modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $\i \to \$o$ thf(p_type, type)
mvalid@(mimplies@(mdia_$s_5$@(mbox_$s_5$@$p$))@(mdia_$s_5$@(mbox_$s_5$@(mdia_$s_5$@(mbox_$s_5$@$p$))))) thf(prove, conjecture)

**SYO460^1.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $\i \to \$o$ thf(p_type, type)
$q$: $\i \to \$o$ thf(q_type, type)
$r$: $\i \to \$o$ thf(r_type, type)
mvalid@(mimplies@(mor@(mdia_k@(mand@$p$@$q$))@(mdia_k@(mand@$p$@$r$)))@(mdia_k@$p$)) thf(prove, conjecture)

**SYO460^2.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $\i \to \$o$ thf(p_type, type)
$q$: $\i \to \$o$ thf(q_type, type)
$r$: $\i \to \$o$ thf(r_type, type)
mvalid@(mimplies@(mor@(mdia_d@(mand@$p$@$q$))@(mdia_d@(mand@$p$@$r$)))@(mdia_d@$p$)) thf(prove, conjecture)

**SYO460^3.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $\i \to \$o$ thf(p_type, type)
$q$: $\i \to \$o$ thf(q_type, type)
$r$: $\i \to \$o$ thf(r_type, type)
mvalid@(mimplies@(mor@(mdia_m@(mand@$p$@$q$))@(mdia_m@(mand@$p$@$r$)))@(mdia_m@$p$)) thf(prove, conjecture)

**SYO460^4.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $\i \to \$o$ thf(p_type, type)
$q$: $\i \to \$o$ thf(q_type, type)
$r$: $\i \to \$o$ thf(r_type, type)
mvalid@(mimplies@(mor@(mdia_b@(mand@$p$@$q$))@(mdia_b@(mand@$p$@$r$)))@(mdia_b@$p$)) thf(prove, conjecture)

**SYO460^5.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $\i \to \$o$ thf(p_type, type)
$q$: $\i \to \$o$ thf(q_type, type)
$r$: $\i \to \$o$ thf(r_type, type)

mvalid@(mimplies@(mor@(mdia_s$_4$@(mand@$p$@$q$))@(mdia_s$_4$@(mand@$p$@$r$)))@(mdia_s$_4$@$p$)) thf(prove, conjecture)

**SYO460^6.p** Ted Sider's propositional modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
$r$: $i → $o thf(r_type, type)
mvalid@(mimplies@(mor@(mdia_s$_5$@(mand@$p$@$q$))@(mdia_s$_5$@(mand@$p$@$r$)))@(mdia_s$_5$@$p$)) thf(prove, conjecture)

**SYO461^1.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_k@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO461^2.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_d@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO461^3.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_m@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO461^4.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_b@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO461^5.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_s$_4$@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO461^6.p** Ted Sider's propositional modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_s$_5$@(mor@$p$@(mnot@$p$)))@(mand@$p$@(mnot@$p$))) thf(prove, conjecture)

**SYO462^2.p** Ted Sider's propositional modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mequiv@$p$@$q$))@(mequiv@(mbox_d@$p$)@(mbox_d@$q$))) thf(prove, conjecture)

**SYO462^3.p** Ted Sider's propositional modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mequiv@$p$@$q$))@(mequiv@(mbox_m@$p$)@(mbox_m@$q$))) thf(prove, conjecture)

**SYO462^4.p** Ted Sider's propositional modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)

mvalid@(mimplies@(mbox_b@(mequiv@$p$@$q$))@(mequiv@(mbox_b@$p$)@(mbox_b@$q$))) thf(prove, conjecture)

**SYO462^5.p** Ted Sider's propositional modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_s4@(mequiv@$p$@$q$))@(mequiv@(mbox_s4@$p$)@(mbox_s4@$q$))) thf(prove, conjecture)

**SYO462^6.p** Ted Sider's propositional modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_s5@(mequiv@$p$@$q$))@(mequiv@(mbox_s5@$p$)@(mbox_s5@$q$))) thf(prove, conjecture)

**SYO463^1.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mequiv@$p$@$q$))@(mbox_k@(mequiv@(mbox_k@$p$)@(mbox_k@$q$)))) thf(prove, conjecture)

**SYO463^2.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mequiv@$p$@$q$))@(mbox_d@(mequiv@(mbox_d@$p$)@(mbox_d@$q$)))) thf(prove, conjecture)

**SYO463^3.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mequiv@$p$@$q$))@(mbox_m@(mequiv@(mbox_m@$p$)@(mbox_m@$q$)))) thf(prove, conjecture

**SYO463^4.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mequiv@$p$@$q$))@(mbox_b@(mequiv@(mbox_b@$p$)@(mbox_b@$q$)))) thf(prove, conjecture)

**SYO463^5.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_s4@(mequiv@$p$@$q$))@(mbox_s4@(mequiv@(mbox_s4@$p$)@(mbox_s4@$q$)))) thf(prove, conjecture

**SYO463^6.p** Ted Sider's propositional modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_s5@(mequiv@$p$@$q$))@(mbox_s5@(mequiv@(mbox_s5@$p$)@(mbox_s5@$q$)))) thf(prove, conjecture

**SYO464^1.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mand@$p$@$q$))@(mbox_k@(mbox_k@(mimplies@(mdia_k@$p$)@(mdia_k@$q$))))) thf(prove, con

**SYO464^2.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mand@$p$@$q$))@(mbox_d@(mbox_d@(mimplies@(mdia_d@$p$)@(mdia_d@$q$))))  thf(prove, co

**SYO464^3.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mand@$p$@$q$))@(mbox_m@(mbox_m@(mimplies@(mdia_m@$p$)@(mdia_m@$q$))))  thf(prove,

**SYO464^4.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mand@$p$@$q$))@(mbox_b@(mbox_b@(mimplies@(mdia_b@$p$)@(mdia_b@$q$))))  thf(prove, co

**SYO464^5.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mand@$p$@$q$))@(mbox_$s_4$@(mbox_$s_4$@(mimplies@(mdia_$s_4$@$p$)@(mdia_$s_4$@$q$))))  thf(prove

**SYO464^6.p** Ted Sider's propositional modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_5$@(mand@$p$@$q$))@(mbox_$s_5$@(mbox_$s_5$@(mimplies@(mdia_$s_5$@$p$)@(mdia_$s_5$@$q$))))  thf(prove

**SYO465^1.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_k@(mdia_k@$p$))@(mdia_k@(mbox_k@$p$)))  thf(prove, conjecture)

**SYO465^2.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_d@(mdia_d@$p$))@(mdia_d@(mbox_d@$p$)))  thf(prove, conjecture)

**SYO465^3.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_m@(mdia_m@$p$))@(mdia_m@(mbox_m@$p$)))  thf(prove, conjecture)

**SYO465^4.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_b@(mdia_b@$p$))@(mdia_b@(mbox_b@$p$)))  thf(prove, conjecture)

**SYO465^5.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mdia_$s_4$@$p$))@(mdia_$s_4$@(mbox_$s_4$@$p$)))  thf(prove, conjecture)

**SYO465^6.p** Ted Sider's propositional modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mbox_s5@(mdia_s5@$p$))@(mdia_s5@(mbox_s5@$p$)))  thf(prove, conjecture)

**SYO467^1.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_k@(mbox_k@$p$))@(mbox_k@(mdia_k@$p$)))  thf(prove, conjecture)

**SYO467^2.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_d@(mbox_d@$p$))@(mbox_d@(mdia_d@$p$)))  thf(prove, conjecture)

**SYO467^3.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_m@(mbox_m@$p$))@(mbox_m@(mdia_m@$p$)))  thf(prove, conjecture)

**SYO467^4.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_b@(mbox_b@$p$))@(mbox_b@(mdia_b@$p$)))  thf(prove, conjecture)

**SYO467^5.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_s4@(mbox_s4@$p$))@(mbox_s4@(mdia_s4@$p$)))  thf(prove, conjecture)

**SYO467^6.p** Ted Sider's propositional modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_s5@(mbox_s5@$p$))@(mbox_s5@(mdia_s5@$p$)))  thf(prove, conjecture)

**SYO468^1.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_k@(mimplies@(mbox_k@$p$)@$q$))@(mbox_k@(mimplies@(mbox_k@$q$)@$p$)))  thf(prove, conjecture)

**SYO468^2.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_d@(mimplies@(mbox_d@$p$)@$q$))@(mbox_d@(mimplies@(mbox_d@$q$)@$p$)))  thf(prove, conjecture)

**SYO468^3.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_m@(mimplies@(mbox_m@$p$)@$q$))@(mbox_m@(mimplies@(mbox_m@$q$)@$p$)))  thf(prove, conjecture)

**SYO468^4.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')

include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_b@(mimplies@(mbox_b@$p$)@$q$))@(mbox_b@(mimplies@(mbox_b@$q$)@$p$)))  thf(prove, conjecture)

**SYO468^5.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_$s_4$@(mimplies@(mbox_$s_4$@$p$)@$q$))@(mbox_$s_4$@(mimplies@(mbox_$s_4$@$q$)@$p$)))  thf(prove, conjecture)

**SYO468^6.p** Ted Sider's propositional modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mor@(mbox_$s_5$@(mimplies@(mbox_$s_5$@$p$)@$q$))@(mbox_$s_5$@(mimplies@(mbox_$s_5$@$q$)@$p$)))  thf(prove, conjecture)

**SYO469^1.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mimplies@(mbox_k@$p$)@$q$))@(mbox_k@(mimplies@(mbox_k@$p$)@(mbox_k@$q$))))  thf(prove

**SYO469^2.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mimplies@(mbox_d@$p$)@$q$))@(mbox_d@(mimplies@(mbox_d@$p$)@(mbox_d@$q$))))  thf(prov

**SYO469^3.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mimplies@(mbox_m@$p$)@$q$))@(mbox_m@(mimplies@(mbox_m@$p$)@(mbox_m@$q$))))  thf(p

**SYO469^4.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mimplies@(mbox_b@$p$)@$q$))@(mbox_b@(mimplies@(mbox_b@$p$)@(mbox_b@$q$))))  thf(prov

**SYO469^5.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mimplies@(mbox_$s_4$@$p$)@$q$))@(mbox_$s_4$@(mimplies@(mbox_$s_4$@$p$)@(mbox_$s_4$@$q$))))  thf(p

**SYO469^6.p** Ted Sider's propositional modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_$s_5$@(mimplies@(mbox_$s_5$@$p$)@$q$))@(mbox_$s_5$@(mimplies@(mbox_$s_5$@$p$)@(mbox_$s_5$@$q$))))  thf(p

**SYO470^1.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)

mvalid@(mequiv@(mdia_k@(mdia_k@(mbox_k@$p$)))@(mbox_k@$p$)) thf(prove, conjecture)

**SYO470^2.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_d@(mdia_d@(mbox_d@$p$)))@(mbox_d@$p$)) thf(prove, conjecture)

**SYO470^3.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_m@(mdia_m@(mbox_m@$p$)))@(mbox_m@$p$)) thf(prove, conjecture)

**SYO470^4.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_b@(mdia_b@(mbox_b@$p$)))@(mbox_b@$p$)) thf(prove, conjecture)

**SYO470^5.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_$s_4$@(mdia_$s_4$@(mbox_$s_4$@$p$)))@(mbox_$s_4$@$p$)) thf(prove, conjecture)

**SYO470^6.p** Ted Sider's propositional modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mequiv@(mdia_$s_5$@(mdia_$s_5$@(mbox_$s_5$@$p$)))@(mbox_$s_5$@$p$)) thf(prove, conjecture)

**SYO471^1.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_k@(mdia_k@$p$))@(mbox_k@(mdia_k@$p$))) thf(prove, conjecture)

**SYO471^2.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_d@(mdia_d@$p$))@(mbox_d@(mdia_d@$p$))) thf(prove, conjecture)

**SYO471^3.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_m@(mdia_m@$p$))@(mbox_m@(mdia_m@$p$))) thf(prove, conjecture)

**SYO471^4.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_b@(mdia_b@$p$))@(mbox_b@(mdia_b@$p$))) thf(prove, conjecture)

**SYO471^5.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mdia_$s_4$@(mdia_$s_4$@$p$))@(mbox_$s_4$@(mdia_$s_4$@$p$))) thf(prove, conjecture)

**SYO471^6.p** Ted Sider's propositional modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)

mvalid@(mimplies@(mdia_s5@(mdia_s5@$p$))@(mbox_s5@(mdia_s5@$p$)))  thf(prove, conjecture)

**SYO472^1.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_k@(mimplies@$p$@(mbox_k@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_k@(mimplies@$p$@$r$))))

**SYO472^2.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_d@(mimplies@$p$@(mbox_d@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_d@(mimplies@$p$@$r$))))

**SYO472^3.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_m@(mimplies@$p$@(mbox_m@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_m@(mimplies@$p$@$r$))))

**SYO472^4.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_b@(mimplies@$p$@(mbox_b@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_b@(mimplies@$p$@$r$))))

**SYO472^5.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_s4@(mimplies@$p$@(mbox_s4@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_s4@(mimplies@$p$@$r$))))

**SYO472^6.p** Ted Sider's propositional modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
$r$: $i → $o  thf(r_type, type)
mvalid@(mimplies@(mbox_s5@(mimplies@$p$@(mbox_s5@(mimplies@$q$@$r$))))@(mimplies@$q$@(mbox_s5@(mimplies@$p$@$r$))))

**SYO473^1.p** Ted Sider's propositional modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_k@(mimplies@(mbox_k@(mequiv@$p$@$q$))@(mdia_k@$q$)))@(mbox_k@(mimplies@(mbox_k@(mequiv

**SYO473^2.p** Ted Sider's propositional modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o  thf(p_type, type)
$q$: $i → $o  thf(q_type, type)
mvalid@(mimplies@(mbox_d@(mimplies@(mbox_d@(mequiv@$p$@$q$))@(mdia_d@$q$)))@(mbox_d@(mimplies@(mbox_d@(mequiv

**SYO473^3.p** Ted Sider's propositional modal logic wff 24

include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_m@(mimplies@(mbox_m@(mequiv@$p$@$q$))@(mdia_m@$q$)))@(mbox_m@(mimplies@(mbox_m@(me

**SYO473^4.p** Ted Sider's propositional modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mimplies@(mbox_b@(mequiv@$p$@$q$))@(mdia_b@$q$)))@(mbox_b@(mimplies@(mbox_b@(mequiv

**SYO473^5.p** Ted Sider's propositional modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mimplies@(mbox_$s_4$@(mequiv@$p$@$q$))@(mdia_$s_4$@$q$)))@(mbox_$s_4$@(mimplies@(mbox_$s_4$@(me

**SYO473^6.p** Ted Sider's propositional modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_$s_5$@(mimplies@(mbox_$s_5$@(mequiv@$p$@$q$))@(mdia_$s_5$@$q$)))@(mbox_$s_5$@(mimplies@(mbox_$s_5$@(me

**SYO474^1.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^1.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_k@(mimplies@(mbox_k@(mimplies@$p$@(mbox_k@$p$)))@(mbox_k@$p$)))@(mimplies@(mdia_k@(mbo

**SYO474^2.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^2.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_d@(mimplies@(mbox_d@(mimplies@$p$@(mbox_d@$p$)))@(mbox_d@$p$)))@(mimplies@(mdia_d@(mbo

**SYO474^3.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^3.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_m@(mimplies@(mbox_m@(mimplies@$p$@(mbox_m@$p$)))@(mbox_m@$p$)))@(mimplies@(mdia_m@(

**SYO474^4.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^4.ax')
$p$: $i → $o thf(p_type, type)
$q$: $i → $o thf(q_type, type)
mvalid@(mimplies@(mbox_b@(mimplies@(mbox_b@(mimplies@$p$@(mbox_b@$p$)))@(mbox_b@$p$)))@(mimplies@(mdia_b@(mbo

**SYO474^5.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^5.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_$s_4$@(mimplies@(mbox_$s_4$@(mimplies@$p$@(mbox_$s_4$@$p$)))@(mbox_$s_4$@$p$)))@(mimplies@(mdia_$s_4$@(

**SYO474^6.p** Ted Sider's propositional modal logic wff 25
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$p$: $i → $o thf(p_type, type)
mvalid@(mimplies@(mbox_$s_5$@(mimplies@(mbox_$s_5$@(mimplies@$p$@(mbox_$s_5$@$p$)))@(mbox_$s_5$@$p$)))@(mimplies@(mdia_$s_5$@(

**SYO475^6.p** Ted Sider's S5 quantified modal logic wff 01

include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mbox_s$_5$@($f$@$x$)))@(mbox_s$_5$@(mforall_ind@λ$x$: mu: ($f$@$x$)))) thf(prove, conje

**SYO476^6.p** Ted Sider's S5 quantified modal logic wff 02
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mbox_s$_5$@(mforall_ind@λ$x$: mu: ($f$@$x$)))@(mforall_ind@λ$x$: mu: (mbox_s$_5$@($f$@$x$)))) thf(prove, conje

**SYO477^6.p** Ted Sider's S5 quantified modal logic wff 03
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mbox_s$_5$@(mexists_ind@λ$x$: mu: ($f$@$x$)))@(mexists_ind@λ$x$: mu: (mbox_s$_5$@($f$@$x$)))) thf(prove, conj

**SYO478^6.p** Ted Sider's S5 quantified modal logic wff 04
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mexists_ind@λ$x$: mu: (mbox_s$_5$@($f$@$x$)))@(mbox_s$_5$@(mexists_ind@λ$x$: mu: ($f$@$x$)))) thf(prove, conj

**SYO479^6.p** Ted Sider's S5 quantified modal logic wff 05
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mdia_s$_5$@($f$@$x$)))@(mdia_s$_5$@(mforall_ind@λ$x$: mu: ($f$@$x$)))) thf(prove, conjec

**SYO480^6.p** Ted Sider's S5 quantified modal logic wff 06
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mdia_s$_5$@(mforall_ind@λ$x$: mu: ($f$@$x$)))@(mforall_ind@λ$x$: mu: (mdia_s$_5$@($f$@$x$)))) thf(prove, conjec

**SYO481^6.p** Ted Sider's S5 quantified modal logic wff 07
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
mvalid@(mforall_ind@λ$x$: mu: (mforall_ind@λ$y$: mu: (mimplies@(mnot@(meq_ind@$x$@$y$))@(mbox_s$_5$@(mnot@(meq_ind@$x$@$y$

**SYO482^6.p** Ted Sider's S5 quantified modal logic wff 08
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
mvalid@(mforall_ind@λ$x$: mu: (mbox_s$_5$@(mexists_ind@λ$y$: mu: (meq_ind@$x$@$y$)))) thf(prove, conjecture)

**SYO483^6.p** Ted Sider's S5 quantified modal logic wff 09
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$a$: mu thf(a_type, type)
mvalid@(mexists_ind@λ$x$: mu: (mbox_s$_5$@(meq_ind@$x$@$a$))) thf(prove, conjecture)

**SYO484^6.p** Ted Sider's S5 quantified modal logic wff 10
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
mvalid@(mforall_ind@λ$x$: mu: (mbox_s$_5$@(mforall_ind@λ$y$: mu: (meq_ind@$x$@$y$)))) thf(prove, conjecture)

**SYO485^6.p** Ted Sider's S5 quantified modal logic wff 11
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
mvalid@(mforall_ind@λ$x$: mu: (mdia_s$_5$@(mexists_ind@λ$y$: mu: (meq_ind@$x$@$y$)))) thf(prove, conjecture)

**SYO486^6.p** Ted Sider's S5 quantified modal logic wff 12
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mbox_s$_5$@(mexists_ind@λ$x$: mu: ($f$@$x$)))@(mdia_s$_5$@(mforall_ind@λ$x$: mu: ($f$@$x$)))) thf(prove, conje

**SYO487^6.p** Ted Sider's S5 quantified modal logic wff 13
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mdia_s5@(mforall_ind@λ$x$: mu: ($f$@$x$)))@(mexists_ind@λ$x$: mu: (mdia_s5@($f$@$x$)))) thf(prove, conjec

**SYO488^6.p** Ted Sider's S5 quantified modal logic wff 14
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
mvalid@(mimplies@(mdia_s5@(mforall_ind@λ$x$: mu: ($f$@$x$)))@(mnot@(mexists_ind@λ$x$: mu: (mbox_s5@(mnot@($f$@$x$))))))

**SYO489^6.p** Ted Sider's S5 quantified modal logic wff 15
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$a$: mu thf(a_type, type)
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mand@(mdia_s5@($f$@$a$))@(mdia_s5@($g$@$a$)))@(mdia_s5@(mand@($f$@$a$)@($g$@$a$)))) thf(prove, conject

**SYO490^6.p** Ted Sider's S5 quantified modal logic wff 16
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$a$: mu thf(a_type, type)
$r$: mu → mu → $i → $o thf(r_type, type)
mvalid@(mimplies@(mexists_ind@λ$x$: mu: (mdia_s5@($r$@$a$@$x$)))@(mdia_s5@(mbox_s5@(mexists_ind@λ$x$: mu: (mexists_ind@λ

**SYO491^6.p** Ted Sider's S5 quantified modal logic wff 17
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mbox_s5@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@($g$@$x$))))@(mforall_ind@λ$x$: mu: (mbox_s5@(mimplie

**SYO492^6.p** Ted Sider's S5 quantified modal logic wff 18
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mbox_s5@(mforall_ind@λ$x$: mu: (mor@($f$@$x$)@($g$@$x$))))@(mforall_ind@λ$x$: mu: (mor@(mbox_s5@($f$@$x$)

**SYO493^6.p** Ted Sider's S5 quantified modal logic wff 19
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mexists_ind@λ$x$: mu: (mbox_s5@(mor@($f$@$x$)@($g$@$x$))))@(mbox_s5@(mor@(mforall_ind@λ$x$: mu: ($f$@$x$)

**SYO494^6.p** Ted Sider's S5 quantified modal logic wff 20
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@(mdia_s5@($g$@$x$))))@(mdia_s5@(mforall_ind@λ$x$: mu: (mimplies

**SYO495^6.p** Ted Sider's S5 quantified modal logic wff 21
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o thf(f_type, type)
$g$: mu → $i → $o thf(g_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mor@(mbox_s5@($f$@$x$))@(mbox_s5@($g$@$x$))))@(mbox_s5@(mforall_ind@λ$x$: mu: (

**SYO496^6.p** Ted Sider's S5 quantified modal logic wff 22
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')

$f$: mu → $i → $o  thf(f_type, type)
$g$: mu → $i → $o  thf(g_type, type)
mvalid@(mimplies@(mbox_s$_5$@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@($g$@$x$))))@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@

**SYO497^6.p** Ted Sider's S5 quantified modal logic wff 23
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$f$: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mand@(mbox_s$_5$@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@(mbox_s$_5$@($f$@$x$)))))@(mdia_s$_5$@(mexists_in

**SYO498^6.p** Ted Sider's S5 quantified modal logic wff 24
include('Axioms/LCL013^0.ax')
include('Axioms/LCL013^6.ax')
$n$: mu → $i → $o  thf(n_type, type)
$o$: mu → $i → $o  thf(o_type, type)
mvalid@(mimplies@(mexists_ind@λ$x$: mu: (mand@($n$@$x$)@(mand@(mforall_ind@λ$y$: mu: (mimplies@($n$@$y$)@(meq_ind@$y$@$x$)

**SYO499^1.p** Explosive confrontation
The Mensa Example: There are not 3 distinct values of type $o.
$a$: $o  thf($a$, type)
$b$: $o  thf($b$, type)
$c$: $o  thf($c$, type)
$f$: $o → $i  thf($f$, type)
$f_1$: $o → $i  thf($f_1$, type)
$f_2$: $o → $i  thf($f_2$, type)
$g$: $o → $i  thf($g$, type)
$g_1$: $o → $i  thf($g_1$, type)
$g_2$: $o → $i  thf($g_2$, type)
($f$@$a$) = ($g$@$b$) or ($f$@$b$) ≠ ($g$@$a$) or ($f_1$@$a$) = ($g_1$@$c$) or ($f_1$@$c$) ≠ ($g_1$@$a$) or ($f_2$@$b$) = ($g_2$@$c$) or ($f_2$@$c$) ≠ ($g_2$@$b$)  thf(co

**SYO500^1.002.p** Two function variant of the Kaminski equation
$x$: $o  thf($x$, type)
$f_0$: $o → $o  thf($f_0$, type)
$f_1$: $o → $o  thf($f_1$, type)
($f_0$@($f_0$@($f_0$@($f_1$@$x$)))) = ($f_0$@($f_1$@($f_1$@($f_1$@$x$))))  thf(kaminski$_2$, conjecture)

**SYO500^1.003.p** Three function variant of the Kaminski equation
$x$: $o  thf($x$, type)
$f_0$: $o → $o  thf($f_0$, type)
$f_1$: $o → $o  thf($f_1$, type)
$f_2$: $o → $o  thf($f_2$, type)
($f_0$@($f_1$@($f_1$@($f_1$@($f_2$@$x$))))) = ($f_0$@($f_0$@($f_0$@($f_1$@($f_2$@($f_2$@($f_2$@$x$))))))  thf(kaminski$_3$, conjecture)

**SYO500^1.004.p** Four function variant of the Kaminski equation
$x$: $o  thf($x$, type)
$f_0$: $o → $o  thf($f_0$, type)
$f_1$: $o → $o  thf($f_1$, type)
$f_2$: $o → $o  thf($f_2$, type)
$f_3$: $o → $o  thf($f_3$, type)
($f_0$@($f_0$@($f_0$@($f_1$@($f_2$@($f_2$@($f_2$@($f_3$@$x$)))))))) = ($f_0$@($f_1$@($f_1$@($f_1$@($f_2$@($f_3$@($f_3$@($f_3$@$x$))))))))  thf(kaminski$_4$, conjectu

**SYO500^1.005.p** Five function variant of the Kaminski equation
$x$: $o  thf($x$, type)
$f_0$: $o → $o  thf($f_0$, type)
$f_1$: $o → $o  thf($f_1$, type)
$f_2$: $o → $o  thf($f_2$, type)
$f_3$: $o → $o  thf($f_3$, type)
$f_4$: $o → $o  thf($f_4$, type)
($f_0$@($f_1$@($f_1$@($f_1$@($f_2$@($f_3$@($f_3$@($f_3$@($f_4$@$x$)))))))))) = ($f_0$@($f_0$@($f_0$@($f_1$@($f_2$@($f_2$@($f_2$@($f_3$@($f_4$@($f_4$@($f_4$@$x$))))))))))))

**SYO500^1.006.p** Six function variant of the Kaminski equation
$x$: $o  thf($x$, type)
$f_0$: $o → $o  thf($f_0$, type)
$f_1$: $o → $o  thf($f_1$, type)

$f_2$: \$o → \$o  thf($f_2$, type)
$f_3$: \$o → \$o  thf($f_3$, type)
$f_4$: \$o → \$o  thf($f_4$, type)
$f_5$: \$o → \$o  thf($f_5$, type)
$(f_0@(f_0@(f_0@(f_1@(f_2@(f_2@(f_2@(f_3@(f_4@(f_4@(f_4@(f_5@x)))))))))))) = (f_0@(f_1@(f_1@(f_1@(f_2@(f_3@(f_3@(f_3@(f_4@(f_5@(f_5$

**SYO500∧1.007.p** Seven function variant of the Kaminski equation
$x$: \$o  thf($x$, type)
$f_0$: \$o → \$o  thf($f_0$, type)
$f_1$: \$o → \$o  thf($f_1$, type)
$f_2$: \$o → \$o  thf($f_2$, type)
$f_3$: \$o → \$o  thf($f_3$, type)
$f_4$: \$o → \$o  thf($f_4$, type)
$f_5$: \$o → \$o  thf($f_5$, type)
$f_6$: \$o → \$o  thf($f_6$, type)
$(f_0@(f_1@(f_1@(f_1@(f_2@(f_3@(f_3@(f_3@(f_4@(f_5@(f_5@(f_5@(f_6@x)))))))))))) = (f_0@(f_0@(f_0@(f_1@(f_2@(f_2@(f_2@(f_3@(f_4@(f_4$

**SYO500∧1.008.p** Eight function variant of the Kaminski equation
$x$: \$o  thf($x$, type)
$f_0$: \$o → \$o  thf($f_0$, type)
$f_1$: \$o → \$o  thf($f_1$, type)
$f_2$: \$o → \$o  thf($f_2$, type)
$f_3$: \$o → \$o  thf($f_3$, type)
$f_4$: \$o → \$o  thf($f_4$, type)
$f_5$: \$o → \$o  thf($f_5$, type)
$f_6$: \$o → \$o  thf($f_6$, type)
$f_7$: \$o → \$o  thf($f_7$, type)
$(f_0@(f_0@(f_0@(f_1@(f_2@(f_2@(f_2@(f_3@(f_4@(f_4@(f_4@(f_5@(f_6@(f_6@(f_6@(f_7@x)))))))))))))))) = (f_0@(f_1@(f_1@(f_1@(f_2@(f_3@$

**SYO500∧1.p** The Kaminski equation
$f$: \$o → \$o  thf($f$, type)
$x$: \$o  thf($x$, type)
$(f@(f@(f@x))) = (f@x)$  thf(con, conjecture)

**SYO501∧1.p** An unsatisfiable normal set with embedded formulas
$x$: \$i  thf($x$, type)
$y$: \$o  thf($y$, type)
$f$: \$i → \$o → \$i  thf($f$, type)
$p$: \$i → \$o  thf($p$, type)
$\neg\, p@(f@x@\neg\,\neg\, y)$ or $p@(f@x@y)$  thf(claim, conjecture)

**SYO502∧1.p** Rules sym and con handle positive equations at i
$a$: \$i  thf($a$, type)
$b$: \$i  thf($b$, type)
$f$: \$i → \$i  thf($f$, type)
$g$: \$i → \$i  thf($g$, type)
$a \neq b$ or $(f@a) \neq (g@b)$ or $(f@b) = (g@a)$  thf(claim, conjecture)

**SYO503∧1.p** Tableau with two branches
$a$: \$o  thf($a$, type)
$b$: \$o  thf($b$, type)
$c$: \$o  thf($c$, type)
$f$: \$o → \$o  thf($f$, type)
$g$: \$o → \$o  thf($g$, type)
$p$: (\$o → \$o) → \$o  thf($p$, type)
$a = b$ or $\neg\, f@a$ or $\neg\, f@b$ or $\neg\, g@a$ or $\neg\, g@b$ or $\neg\, p@f$ or $p@g$  thf(claim, conjecture)

**SYO504∧1.p** Hoeschele p.21
$a$: \$o  thf($a$, type)
$b$: \$o  thf($b$, type)
$h$: \$o → \$o → \$o  thf($h$, type)
$i$: \$o → \$o → \$o  thf($i$, type)
$g$: (\$o → \$o → \$o) → \$o  thf($g$, type)

$f$: (($o → $o → $o) → $o) → $o  thf($f$, type)
((($h@a@b$) = ($a$ and $b$) and ($i@a@b$) = ($a$ or $b$) and ($f@g$) = ($i@a@b$) and $h@a@b$) ⇒ ($f@g$)  thf(claim, conjecture)

**SYO505∧1.p** Explosive confrontation
The Mensa Example at type oo: There are not 5 distinct values of type oo.
$a$: $o → $o  thf($a$, type)
$b$: $o → $o  thf($b$, type)
$c$: $o → $o  thf($c$, type)
$d$: $o → $o  thf($d$, type)
$e$: $o → $o  thf($e$, type)
$f_0$: ($o → $o) → $i  thf($f_0$, type)
$g_0$: ($o → $o) → $i  thf($g_0$, type)
$f_1$: ($o → $o) → $i  thf($f_1$, type)
$g_1$: ($o → $o) → $i  thf($g_1$, type)
$f_2$: ($o → $o) → $i  thf($f_2$, type)
$g_2$: ($o → $o) → $i  thf($g_2$, type)
$f_3$: ($o → $o) → $i  thf($f_3$, type)
$g_3$: ($o → $o) → $i  thf($g_3$, type)
$f_4$: ($o → $o) → $i  thf($f_4$, type)
$g_4$: ($o → $o) → $i  thf($g_4$, type)
$f_5$: ($o → $o) → $i  thf($f_5$, type)
$g_5$: ($o → $o) → $i  thf($g_5$, type)
$f_6$: ($o → $o) → $i  thf($f_6$, type)
$g_6$: ($o → $o) → $i  thf($g_6$, type)
$f_7$: ($o → $o) → $i  thf($f_7$, type)
$g_7$: ($o → $o) → $i  thf($g_7$, type)
$f_8$: ($o → $o) → $i  thf($f_8$, type)
$g_8$: ($o → $o) → $i  thf($g_8$, type)
$f_9$: ($o → $o) → $i  thf($f_9$, type)
$g_9$: ($o → $o) → $i  thf($g_9$, type)
($f_0@a$) = ($g_0@b$)  thf(anotb$_1$, axiom)
($f_0@b$) ≠ ($g_0@a$)  thf(anotb$_2$, axiom)
($f_1@a$) = ($g_1@c$)  thf(anotc$_1$, axiom)
($f_1@c$) ≠ ($g_1@a$)  thf(anotc$_2$, axiom)
($f_2@a$) = ($g_2@d$)  thf(anotd$_1$, axiom)
($f_2@d$) ≠ ($g_2@a$)  thf(anotd$_2$, axiom)
($f_3@a$) = ($g_3@e$)  thf(anote$_1$, axiom)
($f_3@e$) ≠ ($g_3@a$)  thf(anote$_2$, axiom)
($f_4@b$) = ($g_4@c$)  thf(bnotc$_1$, axiom)
($f_4@c$) ≠ ($g_4@b$)  thf(bnotc$_2$, axiom)
($f_5@b$) = ($g_5@d$)  thf(bnotd$_1$, axiom)
($f_5@d$) ≠ ($g_5@b$)  thf(bnotd$_2$, axiom)
($f_6@b$) = ($g_6@e$)  thf(bnote$_1$, axiom)
($f_6@e$) ≠ ($g_6@b$)  thf(bnote$_2$, axiom)
($f_7@c$) = ($g_7@d$)  thf(cnotd$_1$, axiom)
($f_7@d$) ≠ ($g_7@c$)  thf(cnotd$_2$, axiom)
($f_8@c$) = ($g_8@e$)  thf(cnote$_1$, axiom)
($f_8@e$) ≠ ($g_8@c$)  thf(cnote$_2$, axiom)
($f_9@d$) = ($g_9@e$)  thf(dnote$_1$, axiom)
($f_9@e$) ≠ ($g_9@d$)  thf(dnote$_2$, axiom)
$false  thf(mensaoo, conjecture)

**SYO506∧1.p** (if (X = Y) then X else Y) = Y
$c$: $o → $i → $i → $i  thf($c$, type)
∀$x$: $i, $y$: $i: ($c@x$ = $y@x@y$) = $y$ or ¬∀$x$: $i, $y$: $i: ($c@$true@x@y$) = $x$ or ¬∀$x$: $i, $y$: $i: ($c@$false@x@y$) = $y$  thf(claim, conjecture)

**SYO507∧1.p** Example 4.1
$f$: $i → $o  thf($f$, type)
$p$: ($i → $o) → $o  thf($p$, type)
¬$p@f$ and ¬$p@$λ$x$: $i: ¬¬$f@x$  thf(claim, conjecture)

**SYO509^1.p** Existence of choice functions for binary relations
$a$: \$tType  thf($a$, type)
$b$: \$tType  thf($b$, type)
$\exists c_1$: $(a \to b \to \$o) \to a, c_2$: $(a \to b \to \$o) \to b$: $\forall r$: $a \to b \to \$o$: $(\exists x$: $a, y$: $b$: $(r@x@y) \Rightarrow (r@(c_1@r)@(c_2@r)))$  thf(claim, c

**SYO511^1.p** Two different choice operators at type i
eps: $(\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: $(\exists x$: \$i: $(p@x) \Rightarrow (p@(\text{eps}@p)))$  thf(epschoice, axiom)
$\text{eps}_2$: $(\$i \to \$o) \to \$i$  thf($\text{eps}_2$, type)
$\forall p$: $\$i \to \$o$: $(\exists x$: \$i: $(p@x) \Rightarrow (p@(\text{eps}_2@p)))$  thf(eps2choice, axiom)
$\text{eps} = \text{eps}_2$  thf(claim, conjecture)

**SYO512^1.p** Choice operator used to obtain functions from total relations
A choice operator can be used to obtain functions from total relations.
eps: $(\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: $(\exists x$: \$i: $(p@x) \Rightarrow (p@(\text{eps}@p)))$  thf(epschoice, axiom)
$r$: $\$i \to \$i \to \$o$  thf($r$, type)
$\forall x$: \$i: $\exists y$: \$i: $(r@x@y)$  thf(rtotal, axiom)
$\forall x$: \$i: $(r@x@(\text{eps}@(r@x)))$  thf(claim, conjecture)

**SYO513^1.p** There is a choice operator at type o
$\exists c$: $(\$o \to \$o) \to \$o$: $\forall p$: $\$o \to \$o$: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(c@p)))$  thf(choiceo, conjecture)

**SYO514^1.p** A choice operator at type oo
$\exists c$: $((\$o \to \$o) \to \$o) \to \$o \to \$o$: $\forall p$: $(\$o \to \$o) \to \$o$: $(\exists x$: $\$o \to \$o$: $(p@x) \Rightarrow (p@(c@p)))$  thf(choiceoo, conjecture)

**SYO515^1.p** A choice operator at type oo
$t$: $((\$o \to \$o) \to \$o) \to \$o \to \$o$  thf(t_type, type)
$t = (\lambda p$: $(\$o \to \$o) \to \$o, x$: \$o: $(\neg p@\lambda x$: \$o: \$false and $(p@\lambda x$: \$o: \$true or $(p@\lambda x$: \$o: $\neg x) = \neg x)))$  thf($t$, definition)
$\forall p$: $(\$o \to \$o) \to \$o$: $(\exists y$: $\$o \to \$o$: $(p@y) \Rightarrow (p@(t@p)))$  thf($\text{choiceoo}_1$, conjecture)

**SYO516^1.p** Every functional relation corresponds to a function
$r$: $\$i \to \$i \to \$o$  thf(r_type, type)
$\forall x$: \$i: $\exists y$: \$i: $(r@x) = (\lambda z$: \$i: $y = z) \Rightarrow \exists f$: $\$i \to \$i$: $\forall x$: \$i: $(r@x@(f@x))$  thf($\text{descr}_2$, conjecture)

**SYO517^1.p** A description operator at type i
$\exists d$: $(\$i \to \$o) \to \$i$: $\forall p$: $\$i \to \$o$: $(\exists x$: \$i: $(p@x$ and $\forall y$: \$i: $((p@y) \Rightarrow x = y)) \Rightarrow (p@(d@p)))$  thf(descri, conjecture)

**SYO518^1.p** There is an if-then-else operator at type i
$\exists i$: $\$o \to \$i \to \$i \to \$i$: $\forall x$: \$i, $y$: \$i: $((i@\$\text{true}@x@y) = x$ and $(i@\$\text{false}@x@y) = y)$  thf(ifi, conjecture)

**SYO519^1.p** For any X,Y:i, there is a function swapping X and Y
$\forall x$: \$i, $y$: \$i: $\exists f$: $\$i \to \$i$: $((f@x) = y$ and $(f@y) = x)$  thf(ifi, conjecture)

**SYO520^1.p** A simple problem with a choice operator
eps: $(\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: $(\exists x$: \$i: $(p@x) \Rightarrow (p@(\text{eps}@p)))$  thf(epschoice, axiom)
$p$: $\$i \to \$o$  thf($p$, type)
$p@(\text{eps}@\lambda x$: \$i: $\neg p@x)$  thf($\text{ax}_1$, axiom)
$\neg p@(\text{eps}@p)$  thf($\text{ax}_2$, axiom)

**SYO521=1.p** There are more than two integers
$a$: \$int  tff(a_type, type)
$b$: \$int  tff(b_type, type)
$\exists x$: \$int: (\$sum$(2, 2) = x$ and $\forall y$: \$int: $(y = a$ or $y = b))$  tff($a$, conjecture)

**SYO522=1.p** Functions are either odd or even
$f$: (\$int × \$int × \$int) → \$int  tff(f_type, type)
$\exists x$: \$int, $y$: \$int, $z$: \$int: $f(x, x, y) =$ \$product$(2, z)$ or $\exists x$: \$int, $y$: \$int, $z$: \$int: $f(x, y, y) =$ \$sum(\$product$(2, z), 1)$  tff(fxxx

**SYO523=1.p** Injective pigeon hole function
$f$: \$int → \$int  tff(f_type, type)
$(\forall x$: \$int, $y$: \$int: $(f(x) = f(y) \Rightarrow x = y)$ and \$less$(6, f(3))$ and \$less$(f(3), 9)$ and \$less$(6, f(4))$ and \$less$(f(4), 9)) \Rightarrow$
(\$lesseq$(f(5), 6)$ or \$lesseq$(9, f(5)))$  tff(injective_f_pigeonhole, conjecture)

**SYO524=1.p** Monotone function
$f$: \$int → \$int  tff(f_type, type)
$(\forall u$: \$int: \$lesseq$(f(\$\text{sum}(u, 1)), f(\$\text{sum}(u, 2)))$ and \$lesseq$(f(7), 3)) \Rightarrow$ \$lesseq$(f(4), 3)$  tff($\text{co}_1$, conjecture)

**SYO526∧1.p** The BQFQFE problem
$a$: \$o  thf($a$, type)
$b$: \$o  thf($b$, type)
$a \iff b$  thf(ab, axiom)
$f$: \$i → \$o  thf($f$, type)
$g$: \$i → \$o  thf($g$, type)
$f = g$  thf(fg, axiom)
$f = (\lambda x$: \$i: $a)$  thf(fa, axiom)
$g = (\lambda x$: \$i: $b)$  thf(gb, conjecture)

**SYO527∧1.p** Skolem Property on two types
For every total relation r on a * b, there is a corresponding function from a to b.
$a$: \$tType  thf($a$, type)
$b$: \$tType  thf($b$, type)
$r$: $a \to b \to$ \$o  thf($r$, type)
$\forall x$: $a$: $\exists y$: $b$: $(r@x@y)$  thf(rtotal, axiom)
$\exists f$: $a \to b$: $\forall x$: $a$: $(r@x@(f@x))$  thf(skolem, conjecture)

**SYO528∧1.p** There can be 4 distinct choice operators on type \$o
$\text{eps}_1$: (\$o → \$o) → \$o  thf($\text{eps}_1$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_1@p)))$  thf($\text{choiceax}_1$, axiom)
$\text{eps}_2$: (\$o → \$o) → \$o  thf($\text{eps}_2$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_2@p)))$  thf($\text{choiceax}_2$, axiom)
$\text{eps}_3$: (\$o → \$o) → \$o  thf($\text{eps}_3$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_3@p)))$  thf($\text{choiceax}_3$, axiom)
$\text{eps}_4$: (\$o → \$o) → \$o  thf($\text{eps}_4$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_4@p)))$  thf($\text{choiceax}_4$, axiom)
$\text{eps}_1 \neq \text{eps}_2$  thf($\text{choiceax}_{12}$, axiom)
$\text{eps}_1 \neq \text{eps}_3$  thf($\text{choiceax}_{13}$, axiom)
$\text{eps}_1 \neq \text{eps}_4$  thf($\text{choiceax}_{14}$, axiom)
$\text{eps}_2 \neq \text{eps}_3$  thf($\text{choiceax}_{23}$, axiom)
$\text{eps}_2 \neq \text{eps}_4$  thf($\text{choiceax}_{24}$, axiom)
$\text{eps}_3 \neq \text{eps}_4$  thf($\text{choiceax}_{34}$, axiom)

**SYO529∧1.p** There cannot be 5 distinct choice operators on type \$o
$\text{eps}_1$: (\$o → \$o) → \$o  thf($\text{eps}_1$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_1@p)))$  thf($\text{choiceax}_1$, axiom)
$\text{eps}_2$: (\$o → \$o) → \$o  thf($\text{eps}_2$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_2@p)))$  thf($\text{choiceax}_2$, axiom)
$\text{eps}_3$: (\$o → \$o) → \$o  thf($\text{eps}_3$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_3@p)))$  thf($\text{choiceax}_3$, axiom)
$\text{eps}_4$: (\$o → \$o) → \$o  thf($\text{eps}_4$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_4@p)))$  thf($\text{choiceax}_4$, axiom)
$\text{eps}_5$: (\$o → \$o) → \$o  thf($\text{eps}_5$, type)
$\forall p$: \$o → \$o: $(\exists x$: \$o: $(p@x) \Rightarrow (p@(\text{eps}_5@p)))$  thf($\text{choiceax}_5$, axiom)
$\text{eps}_1 \neq \text{eps}_2$  thf($\text{choiceax}_{12}$, axiom)
$\text{eps}_1 \neq \text{eps}_3$  thf($\text{choiceax}_{13}$, axiom)
$\text{eps}_1 \neq \text{eps}_4$  thf($\text{choiceax}_{14}$, axiom)
$\text{eps}_1 \neq \text{eps}_5$  thf($\text{choiceax}_{15}$, axiom)
$\text{eps}_2 \neq \text{eps}_3$  thf($\text{choiceax}_{23}$, axiom)
$\text{eps}_2 \neq \text{eps}_4$  thf($\text{choiceax}_{24}$, axiom)
$\text{eps}_2 \neq \text{eps}_5$  thf($\text{choiceax}_{25}$, axiom)
$\text{eps}_3 \neq \text{eps}_4$  thf($\text{choiceax}_{34}$, axiom)
$\text{eps}_3 \neq \text{eps}_5$  thf($\text{choiceax}_{35}$, axiom)
$\text{eps}_4 \neq \text{eps}_5$  thf($\text{choiceax}_{45}$, axiom)

**SYO530∧1.p** Binary choice on individuals
epsa and epsb work together to give an a and b such that R a b holds, if such an a and b exist for a binary relation R on \$i. A choice operator on i can be used to define a choice operator on i*i (Curried). In this version, the solution is given and the goal is to check that it works.
eps: (\$i → \$o) → \$i  thf(eps, type)

$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsa: (\$i → \$i → \$o) → \$i thf(epsa, type)
epsa = ($\lambda r$: \$i → \$i → \$o: (eps@$\lambda x$: \$i: $\exists y$: \$i: ($r$@$x$@$y$))) thf(epsad, definition)
epsb: (\$i → \$i → \$o) → \$i thf(epsb, type)
epsb = ($\lambda r$: \$i → \$i → \$o: (eps@$\lambda y$: \$i: ($r$@(epsa@$r$)@$y$))) thf(epsbd, definition)
$\forall r$: \$i → \$i → \$o: ($\exists x$: \$i, $y$: \$i: ($r$@$x$@$y$) ⇒ ($r$@(epsa@$r$)@(epsb@$r$))) thf(conj, conjecture)

**SYO531∧1.p** Binary choice on individuals 2
There is an Epsb such that epsa and Epsb work together to give an a and b such that R a b holds, if such an a and b exist for a binary relation R on \$i. A choice operator on i can be used to define a choice operator on i*i (Curried). In this version, the first half of the solution is given.
eps: (\$i → \$o) → \$i thf(eps, type)
$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsa: (\$i → \$i → \$o) → \$i thf(epsa, type)
epsa = ($\lambda r$: \$i → \$i → \$o: (eps@$\lambda x$: \$i: $\exists y$: \$i: ($r$@$x$@$y$))) thf(epsad, definition)
$\exists$epsb: (\$i → \$i → \$o) → \$i: $\forall r$: \$i → \$i → \$o: ($\exists x$: \$i, $y$: \$i: ($r$@$x$@$y$) ⇒ ($r$@(epsa@$r$)@(epsb@$r$))) thf(conj, conjecture)

**SYO532∧1.p** Binary choice on individuals 3
Epsa and (epsb Epsa) work together to give an a and b such that R a b holds, if such an a and b exist for a binary relation R on \$i. A choice operator on i can be used to define a choice operator on i*i (Curried). In this version, the second half of the solution is given.
eps: (\$i → \$o) → \$i thf(eps, type)
$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsb: ((\$i → \$i → \$o) → \$i) → (\$i → \$i → \$o) → \$i thf(epsb, type)
epsb = ($\lambda$epsa: (\$i → \$i → \$o) → \$i, $r$: \$i → \$i → \$o: (eps@$\lambda y$: \$i: ($r$@(epsa@$r$)@$y$))) thf(epsbd, definition)
$\exists$epsa: (\$i → \$i → \$o) → \$i: $\forall r$: \$i → \$i → \$o: ($\exists x$: \$i, $y$: \$i: ($r$@$x$@$y$) ⇒ ($r$@(epsa@$r$)@(epsb@epsa@$r$))) thf(conj, conject

**SYO533∧1.p** Binary choice on individuals 4
There is an Epsa such that Epsa and (epsb Epsa) work together to give an a and b such that R a b holds, if such an a and b exist for a binary relation R on \$i. A choice operator on i can be used to define a choice operator on i*i (Curried). In this version the prover must synthesize both parts of the solution.
$\exists$epsa: (\$i → \$i → \$o) → \$i, epsb: (\$i → \$i → \$o) → \$i: $\forall r$: \$i → \$i → \$o: ($\exists x$: \$i, $y$: \$i: ($r$@$x$@$y$) ⇒ ($r$@(epsa@$r$)@(epsb@$r$))) thf(conj, conjecture)

**SYO534∧1.p** 3-ary choice on individuals
epsa, epsb and epsc work together to give an a, b and c such that R a b c holds, if such an a, b and c exist for a 3-ary relation R on \$i. A choice operator on i can be used to define a choice operator on i*i*i (Curried). In this version, the solution is given and the goal is to check that it works.
eps: (\$i → \$o) → \$i thf(eps, type)
$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsa: (\$i → \$i → \$i → \$o) → \$i thf(epsa, type)
epsa = ($\lambda r$: \$i → \$i → \$i → \$o: (eps@$\lambda x$: \$i: $\exists y$: \$i, $z$: \$i: ($r$@$x$@$y$@$z$))) thf(epsad, definition)
epsb: (\$i → \$i → \$i → \$o) → \$i thf(epsb, type)
epsb = ($\lambda r$: \$i → \$i → \$i → \$o: (eps@$\lambda y$: \$i: $\exists z$: \$i: ($r$@(epsa@$r$)@$y$@$z$))) thf(epsbd, definition)
epsc: (\$i → \$i → \$i → \$o) → \$i thf(epsc, type)
epsc = ($\lambda r$: \$i → \$i → \$i → \$o: (eps@$\lambda z$: \$i: ($r$@(epsa@$r$)@(epsb@$r$)@$z$))) thf(epscd, definition)
$\forall r$: \$i → \$i → \$i → \$o: ($\exists x$: \$i, $y$: \$i, $z$: \$i: ($r$@$x$@$y$@$z$) ⇒ ($r$@(epsa@$r$)@(epsb@$r$)@(epsc@$r$))) thf(conj, conjecture)

**SYO535∧1.p** Choice on relations between individuals and functions
eps: (\$i → \$o) → \$i thf(eps, type)
$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsii: ((\$i → \$i) → \$o) → \$i → \$i thf(epsii, type)
$\forall p$: (\$i → \$i) → \$o: ($\exists x$: \$i → \$i: ($p$@$x$) ⇒ ($p$@(epsii@$p$))) thf(choiceaxii, axiom)
epsa: (\$i → (\$i → \$i) → \$o) → \$i thf(epsa, type)
epsa = ($\lambda r$: \$i → (\$i → \$i) → \$o: (eps@$\lambda x$: \$i: $\exists y$: \$i → \$i: ($r$@$x$@$y$))) thf(epsad, definition)
epsb: (\$i → (\$i → \$i) → \$o) → \$i → \$i thf(epsb, type)
epsb = ($\lambda r$: \$i → (\$i → \$i) → \$o: (epsii@$\lambda y$: \$i → \$i: ($r$@(epsa@$r$)@$y$))) thf(epsbd, definition)
$\forall r$: \$i → (\$i → \$i) → \$o: ($\exists x$: \$i, $y$: \$i → \$i: ($r$@$x$@$y$) ⇒ ($r$@(epsa@$r$)@(epsb@$r$))) thf(conj, conjecture)

**SYO536∧1.p** Choice on relations between functions and individuals
eps: (\$i → \$o) → \$i thf(eps, type)
$\forall p$: \$i → \$o: ($\exists x$: \$i: ($p$@$x$) ⇒ ($p$@(eps@$p$))) thf(choiceax, axiom)
epsii: ((\$i → \$i) → \$o) → \$i → \$i thf(epsii, type)

$\forall p$: ($\$i \to \$i) \to \$o$: ($\exists x$: $\$i \to \$i$: $(p@x) \Rightarrow (p@(\text{epsii}@p))$)  thf(choiceaxii, axiom)
epsa: (($\$i \to \$i) \to \$i \to \$o) \to \$i \to \$i$  thf(epsa, type)
epsa = ($\lambda r$: ($\$i \to \$i) \to \$i \to \$o$: (epsii@$\lambda x$: $\$i \to \$i$: $\exists y$: $\$i$: $(r@x@y)$))  thf(epsad, definition)
epsb: (($\$i \to \$i) \to \$i \to \$o) \to \$i$  thf(epsb, type)
epsb = ($\lambda r$: ($\$i \to \$i) \to \$i \to \$o$: (eps@$\lambda y$: $\$i$: $(r@(\text{epsa}@r)@y)$))  thf(epsbd, definition)
$\forall r$: ($\$i \to \$i) \to \$i \to \$o$: ($\exists x$: $\$i \to \$i, y$: $\$i$: $(r@x@y) \Rightarrow (r@(\text{epsa}@r)@(\text{epsb}@r))$)  thf(conj, conjecture)

**SYO537^1.p** Choice on binary relations between functions
epsii: (($\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsii, type)
$\forall p$: ($\$i \to \$i) \to \$o$: ($\exists x$: $\$i \to \$i$: $(p@x) \Rightarrow (p@(\text{epsii}@p))$)  thf(choiceaxii, axiom)
epsa: (($\$i \to \$i) \to (\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsa, type)
epsa = ($\lambda r$: ($\$i \to \$i) \to (\$i \to \$i) \to \$o$: (epsii@$\lambda x$: $\$i \to \$i$: $\exists y$: $\$i \to \$i$: $(r@x@y)$))  thf(epsad, definition)
epsb: (($\$i \to \$i) \to (\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsb, type)
epsb = ($\lambda r$: ($\$i \to \$i) \to (\$i \to \$i) \to \$o$: (epsii@$\lambda y$: $\$i \to \$i$: $(r@(\text{epsa}@r)@y)$))  thf(epsbd, definition)
$\forall r$: ($\$i \to \$i) \to (\$i \to \$i) \to \$o$: ($\exists x$: $\$i \to \$i, y$: $\$i \to \$i$: $(r@x@y) \Rightarrow (r@(\text{epsa}@r)@(\text{epsb}@r))$)  thf(conj, conjecture)

**SYO538^1.p** If-then-else on $i defined from choice on $i
A choice operator on $i is used to define an if-then-else operator at $i. Check that it works.
eps: ($\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: ($\exists x$: $\$i$: $(p@x) \Rightarrow (p@(\text{eps}@p))$)  thf(choiceax, axiom)
if: $\$o \to \$i \to \$i \to \$i$  thf(if, type)
if = ($\lambda b$: $\$o, x$: $\$i, y$: $\$i$: (eps@$\lambda z$: $\$i$: $((b \text{ and } z = x) \text{ or } (\neg\, b \text{ and } z = y))$))  thf(ifd, definition)
$\forall x$: $\$i, y$: $\$i$: $((\text{if}@\$\text{true}@x@y) = x \text{ and } (\text{if}@\$\text{false}@x@y) = y)$  thf(conj, conjecture)

**SYO539^1.p** Range of if-then-else on $i defined from choice on $i
A choice operator on $i is used to define an if-then-else operator at $i. Check that it always returns the then-part or the else-part.
eps: ($\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: ($\exists x$: $\$i$: $(p@x) \Rightarrow (p@(\text{eps}@p))$)  thf(choiceax, axiom)
if: $\$o \to \$i \to \$i \to \$i$  thf(if, type)
if = ($\lambda b$: $\$o, x$: $\$i, y$: $\$i$: (eps@$\lambda z$: $\$i$: $((b \text{ and } z = x) \text{ or } (\neg\, b \text{ and } z = y))$))  thf(ifd, definition)
$\forall b$: $\$o, x$: $\$i, y$: $\$i$: $((\text{if}@b@x@y) = x \text{ or } (\text{if}@b@x@y) = y)$  thf(conj, conjecture)

**SYO540^1.p** Property of if-then-else on $i defined from choice on $i
A choice operator on $i is used to define an if-then-else operator at $i. Check that if the then-part and the else-part are both X, it returns X.
eps: ($\$i \to \$o) \to \$i$  thf(eps, type)
$\forall p$: $\$i \to \$o$: ($\exists x$: $\$i$: $(p@x) \Rightarrow (p@(\text{eps}@p))$)  thf(choiceax, axiom)
if: $\$o \to \$i \to \$i \to \$i$  thf(if, type)
if = ($\lambda b$: $\$o, x$: $\$i, y$: $\$i$: (eps@$\lambda z$: $\$i$: $((b \text{ and } z = x) \text{ or } (\neg\, b \text{ and } z = y))$))  thf(ifd, definition)
$\forall b$: $\$o, x$: $\$i$: $(\text{if}@b@x@x) = x$  thf(conj, conjecture)

**SYO541^1.p** If-then-else on $i>$i defined from choice on $i>$i
A choice operator on ($i>$i) is used to define an if-then-else operator at ($i>$i). Check that it works.
epsii: (($\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsii, type)
$\forall p$: ($\$i \to \$i) \to \$o$: ($\exists x$: $\$i \to \$i$: $(p@x) \Rightarrow (p@(\text{epsii}@p))$)  thf(choiceaxii, axiom)
if: $\$o \to (\$i \to \$i) \to (\$i \to \$i) \to \$i \to \$i$  thf(if, type)
if = ($\lambda b$: $\$o, x$: $\$i \to \$i, y$: $\$i \to \$i$: (epsii@$\lambda z$: $\$i \to \$i$: $((b \text{ and } z = x) \text{ or } (\neg\, b \text{ and } z = y))$))  thf(ifd, definition)
$\forall x$: $\$i \to \$i, y$: $\$i \to \$i$: $((\text{if}@\$\text{true}@x@y) = x \text{ and } (\text{if}@\$\text{false}@x@y) = y)$  thf(conj, conjecture)

**SYO542^1.p** If-then-else on $i>$i defined from choice on $i>$i
A choice operator on ($i>$i) is used to define an if-then-else operator at ($i>$i). Check that it always returns the then-part or the else-part.
epsii: (($\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsii, type)
$\forall p$: ($\$i \to \$i) \to \$o$: ($\exists x$: $\$i \to \$i$: $(p@x) \Rightarrow (p@(\text{epsii}@p))$)  thf(choiceaxii, axiom)
if: $\$o \to (\$i \to \$i) \to (\$i \to \$i) \to \$i \to \$i$  thf(if, type)
if = ($\lambda b$: $\$o, x$: $\$i \to \$i, y$: $\$i \to \$i$: (epsii@$\lambda z$: $\$i \to \$i$: $((b \text{ and } z = x) \text{ or } (\neg\, b \text{ and } z = y))$))  thf(ifd, definition)
$\forall b$: $\$o, x$: $\$i \to \$i, y$: $\$i \to \$i$: $((\text{if}@b@x@y) = x \text{ or } (\text{if}@b@x@y) = y)$  thf(conj, conjecture)

**SYO543^1.p** If-then-else on $i>$i defined from choice on $i>$i
A choice operator on ($i>$i) is used to define an if-then-else operator at ($i>$i). Check that if the then-part and else-part are both X, then it returns X.
epsii: (($\$i \to \$i) \to \$o) \to \$i \to \$i$  thf(epsii, type)

$\forall p$: ($i → $i) → $o: ($\exists x$: $i → $i: ($p$@$x$) ⇒ ($p$@(epsii@$p$)))  thf(choiceaxii, axiom)
if: $o → ($i → $i) → ($i → $i) → $i → $i  thf(if, type)
if = ($\lambda b$: $o, $x$: $i → $i, $y$: $i → $i: (epsii@$\lambda z$: $i → $i: (($b$ and $z = x$) or (¬ $b$ and $z = y))))  thf(ifd, definition)
$\forall b$: $o, $x$: $i → $i: (if@$b$@$x$@$x$) = $x$  thf(conj, conjecture)

**SYO544^1.p** Case operator from ($o>$o) to $i defined from choice on $i
A case operator from ($o>$o) (with 4 elements) to $i is defined using a choice operator on $i. Check all 4 equations.
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p$@$x$) ⇒ ($p$@(eps@$p$)))  thf(choiceax, axiom)
case: ($o → $o) → $i → $i → $i → $i → $i  thf(caseoo, type)
case = ($\lambda b$: $o → $o, $x$: $i, $y$: $i, $u$: $i, $v$: $i: (eps@$\lambda z$: $i: (($b$ = ($\lambda a$: $o: $false) and $z = x$) or ($b$ = ¬ and $z = y$) or ($b$ = ($\lambda a$: $o: $a$) and $z = u$) or ($b$ = ($\lambda a$: $o: $true) and $z = v$))))  thf(caseood, definition)
$f_0$: $o → $o  thf($f_0$, type)
($f_0$@$false) = $false  thf(f0f, axiom)
($f_0$@$true) = $false  thf(f0t, axiom)
$f_1$: $o → $o  thf($f_1$, type)
($f_1$@$false) = $true  thf(f1f, axiom)
($f_1$@$true) = $false  thf(f1t, axiom)
$f_2$: $o → $o  thf($f_2$, type)
($f_2$@$false) = $false  thf(f2f, axiom)
($f_2$@$true) = $true  thf(f2t, axiom)
$f_3$: $o → $o  thf($f_3$, type)
($f_3$@$false) = $true  thf(f3f, axiom)
($f_3$@$true) = $true  thf(f3t, axiom)
$\forall x$: $i, $y$: $i, $u$: $i, $v$: $i: ((case@$f_0$@$x$@$y$@$u$@$v$) = $x$ and (case@$f_1$@$x$@$y$@$u$@$v$) = $y$ and (case@$f_2$@$x$@$y$@$u$@$v$) = $u$ and (case@$f_3$@$x$@$y$@$u$@$v$) = $v$)  thf(conj, conjecture)

**SYO545^1.p** Property of case from ($o>$o) to $i defined from choice on $i
A choice operator on $i is used to define an if-then-else operator at $i. Check that case always returns one of the four given results.
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p$@$x$) ⇒ ($p$@(eps@$p$)))  thf(choiceax, axiom)
case: ($o → $o) → $i → $i → $i → $i → $i  thf(caseoo, type)
case = ($\lambda b$: $o → $o, $x$: $i, $y$: $i, $u$: $i, $v$: $i: (eps@$\lambda z$: $i: (($b$ = ($\lambda a$: $o: $false) and $z = x$) or ($b$ = ¬ and $z = y$) or ($b$ = ($\lambda a$: $o: $a) and $z = u$) or ($b$ = ($\lambda a$: $o: $true) and $z = v$))))  thf(caseood, definition)
$f$: $o → $o  thf($f$, type)
$\forall x$: $i, $y$: $i, $u$: $i, $v$: $i: ((case@$f$@$x$@$y$@$u$@$v$) = $x$ or (case@$f$@$x$@$y$@$u$@$v$) = $y$ or (case@$f$@$x$@$y$@$u$@$v$) = $u$ or (case@$f$@$x$@$y$@$u$@$v$) = $v$)  thf(conj, conjecture)

**SYO546^1.p** Property of case from ($o>$o) to $i defined from choice on $i
A choice operator on $i is used to define an if-then-else operator at $i. Check that case always returns one of the four given results.
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p$@$x$) ⇒ ($p$@(eps@$p$)))  thf(choiceax, axiom)
case: ($o → $o) → $i → $i → $i → $i → $i  thf(caseoo, type)
case = ($\lambda b$: $o → $o, $x$: $i, $y$: $i, $u$: $i, $v$: $i: (eps@$\lambda z$: $i: (($b$ = ($\lambda a$: $o: $false) and $z = x$) or ($b$ = ¬ and $z = y$) or ($b$ = ($\lambda a$: $o: $a) and $z = u$) or ($b$ = ($\lambda a$: $o: $true) and $z = v$))))  thf(caseood, definition)
$f$: $o → $o  thf($f$, type)
$\forall x$: $i: (case@$f$@$x$@$x$@$x$@$x$) = $x$  thf(conj, conjecture)

**SYO547^1.p** Choice Complement
The choice operator applied to complements of predicates chooses an element not in the predicate, if there is one.
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p$@$x$) ⇒ ($p$@(eps@$p$)))  thf(choiceax, axiom)
epscomp: ($i → $o) → $i  thf(epscomp, type)
epscomp = ($\lambda p$: $i → $o: (eps@$\lambda x$: $i: ¬ $p$@$x$))  thf(epscompd, definition)
$\forall p$: $i → $o: ($\exists x$: $i: ¬ $p$@$x$ ⇒ ¬ $p$@(epscomp@$p$))  thf(choicecomp, conjecture)

**SYO548^1.p** hoice complement
There is an operator that chooses an element not in the predicate, if there is one.
$\exists e$: ($i → $o) → $i: $\forall p$: $i → $o: ($\exists x$: $i: ¬ $p$@$x$ ⇒ ¬ $p$@($e$@$p$))  thf(choicecomp, conjecture)

**SYO549^1.p** The eta double negation problem

$p$: ($o → $o) → ($o → $o) → $o  thf($p$, type)
$f$: $o → $o  thf($f$, type)
$g$: $o → $o  thf($g$, type)
$p@\lambda x$: $o: ($f@\neg\neg x)@g$  thf(pfg, axiom)
$p@f@\lambda x$: $o: ($g@\neg\neg x)$  thf(pfgc, conjecture)

**SYO550^1.p** The identity function on individuals exists
$\exists f$: $i → $i: $\forall x$: $i: ($f@x) = x$  thf(claim, conjecture)

**SYO551^1.p** The identity function on functions from $i to $i exists
$\exists f$: ($i → $i) → $i → $i: $\forall x$: $i → $i: ($f@x) = x$  thf(claim, conjecture)

**SYO552^1.p** The first projection exists
There is a binary function that returns its first argument
$\exists f$: $i → $i → $i: $\forall x$: $i, $y$: $i: ($f@x@y) = x$  thf(claim, conjecture)

**SYO553^1.p** The second projection exists.
There is a binary function that returns its second argument.
$\exists f$: $i → $i → $i: $\forall x$: $i, $y$: $i: ($f@x@y) = y$  thf(claim, conjecture)

**SYO554^1.p** Teucke's example
$p$: $i → $o  thf($p$, type)
$s$: $i  thf($s$, type)
$t$: $i  thf($t$, type)
$u$: $i  thf($u$, type)
$p@s$ or $p@t$  thf(pst, axiom)
$\neg p@u$ or $\neg p@t$  thf(puv, axiom)
$s = t$  thf(st, axiom)
$t = u$  thf(tu, axiom)

**SYO555^1.p** If-then-else defined from choice is independent of choice
$\text{eps}_1$: ($i → $o) → $i  thf($\text{eps}_1$, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p@x$) ⇒ ($p@($\text{eps}_1@p$)))  thf($\text{choiceax}_1$, axiom)
$\text{if}_1$: $o → $i → $i → $i  thf($\text{if}_1$, type)
$\text{if}_1 = (\lambda b$: $o, $x$: $i, $y$: $i: ($\text{eps}_1@\lambda z$: $i: (($b$ and $z = x$) or ($\neg b$ and $z = y$))))  thf(if1d, definition)
$\text{eps}_2$: ($i → $o) → $i  thf($\text{eps}_2$, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p@x$) ⇒ ($p@($\text{eps}_2@p$)))  thf($\text{choiceax}_2$, axiom)
$\text{if}_2$: $o → $i → $i → $i  thf($\text{if}_2$, type)
$\text{if}_2 = (\lambda b$: $o, $x$: $i, $y$: $i: ($\text{eps}_2@\lambda z$: $i: (($b$ and $z = x$) or ($\neg b$ and $z = y$))))  thf(if2d, definition)
$\text{if}_1 = \text{if}_2$  thf(conj, conjecture)

**SYO556^1.p** Relationship between if-then-else and choice on $
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p@x$) ⇒ ($p@(eps@p))) thf(choiceax, axiom)
if: $o → $i → $i → $i  thf(if, type)
if = ($\lambda b$: $o, $x$: $i, $y$: $i: (eps@$\lambda z$: $i: (($b$ and $z = x$) or ($\neg b$ and $z = y$))))  thf(ifd, definition)
$\forall p$: $i → $o: (eps@$p$) = (if@$\exists x$: $i: ($p@x$)@(eps@$p$)@(eps@$\lambda x$: $i: $false))  thf(conj, conjecture)

**SYO557^1.p** Exists on $i can be expressed in terms of choice on $
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p@x$) ⇒ ($p@(eps@p))) thf(choiceax, axiom)
($\lambda p$: $i → $o: ($p@(eps@p))) = ($\lambda p$: $i → $o: ??($p$))  thf(conj, conjecture)

**SYO558^1.p** Forall on $i can be expressed in terms of choice on $
eps: ($i → $o) → $i  thf(eps, type)
$\forall p$: $i → $o: ($\exists x$: $i: ($p@x$) ⇒ ($p@(eps@p))) thf(choiceax, axiom)
($\lambda p$: $i → $o: ($p@(eps@$\lambda x$: $i: $\neg p@x$))) = ($\lambda p$: $i → $o: !!($p$))  thf(conj, conjecture)

**SYO559^1.p** Choice on $o>$o applied to choice on $o cannot be negatio
epso: ($o → $o) → $o  thf(epso, type)
$\forall p$: $o → $o: ($\exists x$: $o: ($p@x$) ⇒ ($p@(epso@p))) thf(choiceaxo, axiom)
epsoo: (($o → $o) → $o) → $o → $o  thf(epsoo, type)
$\forall p$: ($o → $o) → $o: ($\exists x$: $o → $o: ($p@x$) ⇒ ($p@(epsoo@p))) thf(choiceaxoo, axiom)
(epsoo@epso@$false) ⇒ (epsoo@epso@$true)  thf($c$, conjecture)

**SYO560^1.p** Choice on $o>$o applied to choice on $o is identity or constant

epso: ($o → $o) → $o  thf(epso, type)
∀p: $o → $o: (∃x: $o: (p@x) ⇒ (p@(epso@p)))  thf(choiceaxo, axiom)
epsoo: (($o → $o) → $o) → $o → $o  thf(epsoo, type)
∀p: ($o → $o) → $o: (∃x: $o → $o: (p@x) ⇒ (p@(epsoo@p)))  thf(choiceaxoo, axiom)
q: ($o → $o) → $o  thf(q, type)
q@λx: $o: $true  thf(qkt, axiom)
q@λx: $o: $false  thf(qkf, axiom)
q@λx: $o: x  thf(qid, axiom)
q@(epsoo@epso)  thf(c, conjecture)

**SYO561+1.p** Distinct objects
"Apple" ≠ "Microsoft"  fof(apple_not_microsoft, conjecture)

**SYO561_1.p** Distinct objects
company: $tType  tff(company_type, type)
apple: company  tff(apple_company, type)
microsoft: company  tff(microsoft_company, type)
$distinct(apple, microsoft)  tff(distinct_companies, axiom)
apple ≠ microsoft  tff(apple_not_microsoft, conjecture)

**SYO561_2.p** Distinct objects
"Apple" ≠ "Microsoft"  tff(apple_not_microsoft, conjecture)

**SYO562_1.p** If-then-else
a: $i  tff(a_type, type)
f: $i → $i  tff(f_type, type)
p: $i → $o  tff(p_type, type)
q: ($i × $i) → $o  tff(q_type, type)
∀z: $i: $ite_f(∃x: p(f(x)), ∀x: q(x, x), q(z, a))  tff(ite_f, axiom)
p($ite_t(q(a, f(a)), a, f(a)))  tff(ite_t, axiom)
q(a, a)  tff(fact, axiom)
q(f(a), f(a))  tff(prove, conjecture)

**SYO563+1.p** Unequal numbers - reals
$1.0 \neq 2.0$  fof(one_not_equal_to$_2$, conjecture)

**SYO563+2.p** Unequal numbers - rationals
$1/1 \neq 2/1$  fof(one_not_equal_to$_2$, conjecture)

**SYO563+3.p** Unequal numbers - integers
$1 \neq 2$  fof(one_not_equal_to$_2$, conjecture)

**SYO564^7.p** Barcan scheme instance. (Ted Sider's qml wwf 1)
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
f: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mforall_ind@λx: mu: (mbox_s$_4$@(f@x)))@(mbox_s$_4$@(mforall_ind@λx: mu: (f@x))))  thf(con, conject

**SYO565^7.p** Fitting and Mendelsohn problem
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
a: mu → $i → $o  thf(a_type, type)
mvalid@(mequiv@(mbox_s$_4$@(mforall_ind@λx: mu: (a@x)))@(mdia_s$_4$@(mforall_ind@λx: mu: (mbox_s$_4$@(a@x)))))  thf(co

**SYO566^7.p** Girle problem
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
g: mu → $i → $o  thf(g_type, type)
f: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mbox_s$_4$@(mforall_ind@λx: mu: (mimplies@(f@x)@(g@x))))@(mimplies@(mforall_ind@λx: mu: (f@x))@

**SYO567^7.p** Girle problem
include('Axioms/LCL015^0.ax')

include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$g$: mu → $i → $o  thf(g_type, type)
$f$: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mimplies@($f$@$x$)@(mbox_s$_4$@($g$@$x$))))@(mimplies@(mforall_ind@λ$x$: mu: ($f$@$x$))@

**SYO568^7.p** Girle problem
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$f$: mu → $i → $o  thf(f_type, type)
$a$: mu  thf(a_type, type)
∀$v$: $i: (exists_in_world@$a$@$v$)  thf(existence_of_a_ax, axiom)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mor@(mbox_s$_4$@($f$@$x$))@(mbox_s$_4$@(mnot@($f$@$x$)))))@(mbox_s$_4$@(mequiv@(mbo

**SYO569^7.p** Fitting and Mendelsohn problem
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$g$: mu → $i → $o  thf(g_type, type)
$f$: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mand@(mforall_ind@λ$x$: mu: (mbox_s$_4$@(mbox_s$_4$@($f$@$x$))))@(mdia_s$_4$@(mexists_ind@λ$x$: mu: ($g$@$x$))))

**SYO570^7.p** Forbes problem
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$r$: mu → mu → $i → $o  thf(r_type, type)
mvalid@(mimplies@(mforall_ind@λ$x$: mu: (mbox_s$_4$@(mforall_ind@λ$y$: mu: ($r$@$x$@$y$))))@(mforall_ind@λ$x$: mu: (mforall_ind@

**SYO571^7.p** Quantified modal logics wwfs. problem 9.
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$a$: mu  thf(a_type, type)
∀$v$: $i: (exists_in_world@$a$@$v$)  thf(existence_of_a_ax, axiom)
mvalid@(mexists_ind@λ$x$: mu: (mbox_s$_4$@(qmltpeq@$x$@$a$)))  thf(con, conjecture)

**SYO572^7.p** Quantified modal logics wwfs. problem 13.
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$f$: mu → $i → $o  thf(f_type, type)
mvalid@(mimplies@(mdia_s$_4$@(mforall_ind@λ$x$: mu: ($f$@$x$)))@(mexists_ind@λ$x$: mu: (mdia_s$_4$@($f$@$x$))))  thf(con, conjectu

**SYO573^7.p** Quantified modal logics wwfs. problem 15.
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$g$: mu → $i → $o  thf(g_type, type)
$f$: mu → $i → $o  thf(f_type, type)
$a$: mu  thf(a_type, type)
∀$v$: $i: (exists_in_world@$a$@$v$)  thf(existence_of_a_ax, axiom)
mvalid@(mimplies@(mand@(mdia_s$_4$@($f$@$a$))@(mdia_s$_4$@($g$@$a$)))@(mdia_s$_4$@(mand@($f$@$a$)@($g$@$a$))))  thf(con, conjectur

**SYO574^7.p** Modal Propositional Logic Theorems. problem 37
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$q$: $i → $o  thf(q_type, type)
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_s$_4$@(mimplies@$p$@(mbox_s$_4$@$q$)))@(mimplies@(mbox_s$_4$@$p$)@(mdia_s$_4$@$q$)))  thf(con, conjecture

**SYO575^7.p** Modal Propositional Logic Theorems. problem 50

include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mequiv@(mdia_s4@(mdia_s4@(mdia_s4@(mbox_s4@$p$))))@(mbox_s4@$p$))  thf(con, conjecture)

**SYO576^7.p** Mixed Modal Propositional Logic WFFs. problem 7
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$p$: $i → $o  thf(p_type, type)
mvalid@(mimplies@(mdia_s4@(mbox_s4@(mdia_s4@(mbox_s4@$p$))))@(mdia_s4@(mbox_s4@$p$)))  thf(con, conjecture)

**SYO577^7.p** Mixed Modal Propositional Logic WFFs. problem 19
include('Axioms/LCL015^0.ax')
include('Axioms/LCL013^5.ax')
include('Axioms/LCL015^1.ax')
$q$: $i → $o  thf(q_type, type)
$p$: $i → $o  thf(p_type, type)
mvalid@(mor@(mbox_s4@(mimplies@(mbox_s4@$p$)@$q$))@(mbox_s4@(mimplies@(mbox_s4@$q$)@$p$)))  thf(con, conjecture)