Fundamental Theorems of Mathematics

Challenge yourself: figure out (or find out) **why** they are true

**Fundamental Theorem of Arithmetic:** Every positive integer has a prime factorisation, unique up to the order of the factors

**Fundamental Theorem of Algebra:** Every nonconstant polynomial over the field of complex numbers has at least one root

**Fundamental Theorem of Calculus:** For every continuous function \( f \) on an interval \([a, b]\) the function \( g(x) = \int_a^x f(t) \, dt \) is an antiderivative of \( f \) on \((a, b)\)

**Fundamental Theorem of Linear Algebra:** The row space of a matrix is orthogonal to the nullspace of the matrix, and the dimensions add up to the number of columns of the matrix