Theorem: There is an infinite amount of positive primes.

proof Assume there is a finite amount of primes $\mathbf{P} = \{2, 3, 5, \ldots, p_n\}$. Let $q = 2 \cdot 3 \cdot 5 \cdot \cdots \cdot p_n + 1$ be the product of all the primes plus 1. By construction,

$$q \equiv 1 \pmod{p_i}$$

for any prime $p_i \in \mathbf{P}$. Thus q is not divisible by any prime, and so it follows from the fundamental theorem of arithmetic that q must itself be prime. However, clearly $q > p_i$ for all $p_i \in \mathbf{P}$, so $q \notin \mathbf{P}$, but $\mathbf{P}$ is the set of all primes. Thus there cannot be a finite amount of primes. $\square$