Another Proof By Contradiction

Claim: There are infinitely many primes.

Proof:

Suppose for the sake of contradiction, that there are only finitely many primes. Call them \( p_1, p_2, \ldots, p_k \).

Consider the number \( q = p_1 \cdot p_2 \cdot \cdots \cdot p_k + 1 \)

Case 1: \( q \) is prime

Case 2: \( q \) is composite

But [] is a contradiction! So there must be infinitely many primes.