CSE 311: Foundations of Computing I

Induction Verification: Bad Proof

Claim: Prove $3^n \geq n^2$ for all $n \geq 3$.

Candidate Proof:

Let $P(k)$ be "$3^k \geq k^2$". We go by induction on k.

Base Case:

$$3^0 \geq 0^2$$
$$3^3 \geq 3^2$$
$$27 \geq 9$$

So, the base case is true.

Induction Hypothesis: Suppose $P(k)$ is true for arbitrary $k \in \mathbb{N}$.

Induction Step: Then, $3^{k+1} = 3(3^k) \geq 3(k^2) > k^2+2k+1 = (k+1)^2$, by inequalities and factoring.

Since $P(k) \rightarrow P(k+1)$ for arbitrary k, it is true for all $k \geq 3$, by induction.