Proof by Induction

Prove that $n^3 + 11n$ is divisible by 3 for $n \in \mathbb{Z}, n > 0$

Show true for n = 1

$1^3 + 11 \times 1 = 12$
$12 = 3 \times 4$

Assume true for *n = k*

Assume $k^3 + 11k$ is divisible by 3

$k^3 + 11k = 3m \quad m \in \mathbb{Z}$

Show true for *n = k + 1*

Show $(k+1)^3 + 11(k+1)$ is divisible by 3

$$(k+1)^3 + 11(k+1) \equiv k^3 + 3k^2 + 3k + 1 + 11k + 11$$

$$\equiv k^3 + 11k + 3k^2 + 3k + 12$$

$$\equiv 3m + 3(k^2 + k + 4)$$

Concluding statement

True for n = 1
Assuming it is true for n = k then it is true for n = k + 1
Therefore it is true for all $n \in \mathbb{Z}, n > 0$