3. **[5 pts]** Let $n \in Z$. Prove that n^2 leaves a remainder of 0 or 1 when divided by 3. (Hint : Proof by cases. There are three possibilities for n. n = 3k, n = 3k +1, n= 3k +2)

① Let $n \in \mathbb{Z}$ [assumption]

② $\exists k \in \mathbb{Z}$, for $\forall n \in \mathbb{Z}$, $n=3k$ or $n=3k+1$ or $n=3k+2$ [from ①]

③ If $n=3k$, $n^2=9k^2$, $n^2 \bmod 3 = 0$ [from ②]

④ If $n=3k+1$, $n^2=9k^2+6k+1$, $n^2 \bmod 3 = 1$ [from ②]

⑤ If $n=3k+2$, $n^2=9k^2+12k+4$, $n^2 \bmod 4 = 1$ [from ②]

⑥ $n^2 \bmod 3 = 0$ or $n^2 \bmod 3 = 1$ [from ③④⑤]