Assignment 6 (additional problems)

1. Use the Division Algorithm to prove that every even integer is either of the form $4k$ or $4k+2$ for some integer k, i.e. show

$$\forall a \in \mathbb{Z}, a \text{ is even } \Rightarrow \left(\exists k \in \mathbb{Z}, a = 4k \text{ or } a = 4k+2\right)$$

2. Prove that the fourth power of any integer is of the form $5k$ or $5k+1$ for some integer k, i.e show

$$\forall a \in \mathbb{Z}, \exists k \in \mathbb{Z}, a^4 = 5k \text{ or } a^4 = 5k+1$$