Question 1:

Base:

$$fact(1) = 1$$

Induction step:

Suppose that $fact(k)$ correctly calculates the k'th factorial for some $1 \leq k \in \mathbb{N}$. Then we want to show that $fact(k+1)$ correctly calculates the $(k+1)'th$ factorial. We find

$$fact(k+1) = (k+1) \cdot fact(k+1-1) = (k+1) \cdot fact(k)$$

Hence $fact(k+1)$ is true, since $fact(k)$ is true by the inductive hypothesis and $(k+1) \cdot k! = (k+1)!$