

Assign 3 Q 2

Claim: For all k and for any Acc : $\text{pow_tl}(n, k, Acc) = Acc * \text{pow}(n, k)$

Proof will be by induction on k .

Base Case:

$$\text{pow_tl}(n, 0, Acc) = Acc * \text{pow}(n, k)$$

$$|-> Acc = Acc * 1 \quad \text{-by function def of pow and pow_tl}$$

$$|-> Acc = Acc$$

Induction Hypothesis:

$$\text{pow_tl}(n, k, Acc) = Acc * \text{pow}(n, k)$$

Induction Step:

$$\text{Show } \text{pow_tl}(n, k+1, Acc) = Acc * \text{pow}(n, k+1)$$

$$\text{pow_tl}(n, k+1, Acc) = Acc * \text{pow}(n, k+1)$$

$$|-> \text{pow_tl}(n, k, Acc * n) = Acc * (n * \text{pow}(n, k)) \quad \text{-by def of pow and pow_tl}$$

$$|-> (Acc * n) \text{ pow } (n, k) = Acc * n * \text{pow}(n, k) \quad \text{-by IH}$$

$$|-> Acc * n * \text{pow}(n, k) = Acc * n * \text{pow}(n, k)$$

This completes the proof