Name: _____

Directions: Solve the following problems. Give supporting work/justification where appropriate.

1. [**3 points**] Suppose $a, b \in \mathbb{Z}$. Prove that if ab is odd, then $a^2 + b^2$ is even.

2. [**3 points**] Prove that there exist unique real numbers a and b such that the linear function f given by $f(x) = ax + b$ satisfies $f(f(x)) = x + 1$.

3. [**4 points**] Let A, B, and C be sets. Show that $A \times B \subseteq A \times C$ if and only if $A = \varnothing$ or $B \subseteq C$.