Name: _____

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

1. [**4 parts, 1 point each**] Suppose that the following sentences appear in a proof. If the sentence is stylistically poor or grammatically incorrect, then rewrite the sentence to fix these problems. Otherwise, write "OK".

   (a) The definition of an odd integer is $x = 2a + 1$ for any $a \in \mathbb{Z}$.

   (b) If one set is not a $\subseteq$ of another, then they are $\neq$.

   (c) Each point in the plane is contained in infinitely many lines.

   (d) x is even $\Rightarrow x = 2k$ where $k \in \mathbb{Z}$.

2. [**2 points**] Prove that if n is an integer and $36 \nmid n^2$, then $2 \nmid n$ or $3 \nmid n$.

3. [**2 points**] Suppose that $x \in \mathbb{R}$. Prove that if $x^3 - 2x^2 - 3x \geq 0$, then $x \geq -1$.

4. [**2 points**] Let $a \in \mathbb{Z}$. Show that $a^2 \equiv a \pmod{2}$.