

Name: _____

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

1. [4 points] Suppose that $a, b, c \in \mathbb{Z}$. Prove that if $a \mid b$ and $a \mid c$, then $a \mid b + c$.

2. [3 points] Suppose that $x, y \in \mathbb{R}$. Prove that if $7x^2 + y = 7x + xy$, then $x = 1$ or $y = 7x$.

3. [**3 points**] Suppose that $n \in \mathbb{Z}$. Prove that if $3 \nmid n$, then $3 \mid n^2 + 2$. Hint: use the division lemma to divide n by 3 and try cases depending on the remainder.