Name: _____

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

1. **[2.5 points]** Let x and y be real numbers. Prove that if x is rational and xy is irrational, then y is irrational.

2. **[2.5 points]** Let a and n be integers. Prove that if $a \mid n$ and $a \mid n+1$, then $a = 1$ or $a = -1$.

3. **[2.5 points]** Let n be an odd positive integer. Prove that $\sqrt{2n}$ is irrational.

4. **[2.5 points]** Let n be an integer. Prove that $3 \nmid n^2 + 1$.