Name:

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

- 1. [2 points] How many subsets of  $\{1, 2, ..., 9\}$  have size 4? Give a numerical answer.
- 2. [4 points] Prove that  $\sqrt{5}$  is irrational. You may use that if  $a \in \mathbb{Z}$  and  $5 \mid a^2$ , then  $5 \mid a$ .

3. [4 points] Use a proof by contradiction to show that if  $n \in \mathbb{Z}$ , then  $4 \nmid n^2 + 2$ .