Homework 1
CSCI 301

1. [2 points] Explicitly write out the contents of the following set:

$$X \in \mathcal{P}(\{1,2,3\}): 2 \in X$$

2. [3 points] Negate the following statement:

   If x is a rational number and $x \neq 0$, then tan(x) is not a rational number.

   Prove each of the following statements.
   Explicitly state which method of proof you are using: direct, contrapositive, contradiction etc.

3. [5 points] Suppose $a \in \mathbb{Z}$. If a² is not divisible by 4, then a is odd.

4. [5 points] Suppose, $a, b \in \mathbb{Z}$. If $4 \mid (a^2 + b^2)$, then a and b are not both odd.

5. [10 points] Given an integer a and b, then a²(b+3) is even if and only if a is even or b is odd.