MCS 150 Homework 1

1. Let $A = \{x \in \mathbb{Z}^+ \mid x \text{ is prime}\}$ and $B = \{n \mid n = k^2 + m^2 \text{ for some integer } k \text{ and } m\}$.
   (a) List five elements of A and five elements of B.
   (b) List five elements of each of the sets $A \cap B$, $A \setminus B$, and $B \setminus A$.
2. Let A and B be sets. Of the following statements, which are true and which are false? If you think a statement is true, find a convincing argument to show it is true; if not, find an argument or a counterexample to show it is false.
   (a) $(A \cup B) \setminus (A \cap B) = (A \setminus B) \cup (B \setminus A)$
   (b) $(A \cup B) \setminus B = A$
   (c) $(A \setminus B) \setminus A = A \setminus (B \setminus A)$
3. Prove the following statements.
   (a) Let k and n be integers. If n is even, then kn is even.
   (b) If k and n are both odd, then kn is odd.