Problem Set 11

Due: Monday, March 9th

Instructions: Answer each of the following questions and provide a justification for your answer. In addition to the points assigned below, you will receive 0-2 writing points for the entire problem set.

1. Describe the following sets in the form $X = \{x \mid \text{ statement about } x\}$. Feel free to use the logical symbols you have learned.

   (a) $A = \{7, 14, 21, 28, 35, \cdots\}$.
   (b) $B = \{11, 21, 31, 41, 51, \cdots\}$.
   (c) $C = \{1, 3, 9, 27, 81, \cdots\}$.

2. Describe the following sets as a list, the way the sets are given in the previous exercise.

   (a) $A = \{x \in \mathbb{N} \mid x \text{ is even and prime}\}$.
   (b) $B = \{x \in \mathbb{Q} \mid 5x \in \mathbb{Z} \text{ and } 0 \leq x < 2\}$.
   (c) $C = \{x \in \mathbb{Z} \mid \sqrt{x} \in \mathbb{Z} \text{ and } x \leq 30\}$.

3. Prove for any sets A and B, that

$$(A \cap B) \setminus C = (A \setminus C) \cup (B \setminus C).$$

4. Prove for any sets A and B, that

$$\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B).$$

5. Prove that for any sets A, B, and C that

$$(A \cap B) \cup C = A \cup C \cap (B \cup C)\,.$$