DUE: Tuesday, September 7

1. (12 points) Do Exercise 1.3.22 of our text.

2. (5 points) Do Exercise 1.3.24 of our text.

3. (4 points) (a) Give an interpretation in which $(\forall x)(\exists y)(P(x) \lor Q(x, y))$ is true.

   (b) Give an interpretation in which $(\forall x)(\exists y)(P(x) \lor Q(x, y))$ is false.

4. (8 points) Do Exercise 1.4.16 of our text. For each problem for which your answer is yes, describe the set whose power set is displayed.

5. (5 points) Let $\mathbb{Z}^+$ be the set of positive integers. That is, $\mathbb{Z}^+ =$ \{1, 2, 3, 4, \ldots\}. For $x, y \in \mathbb{Z}^+$, define the (infix) predicate $|$ by $x \mid y \iff (\exists z \in \mathbb{Z}^+) y = x \cdot z$, that is $x \mid y$ means that $x$ divides $y$ evenly. Finally, define $R = \{x \in \mathbb{Z}^+ \mid 2 \mid x\}$ (R is the set of all even positive integers), $S = \{x \in \mathbb{Z}^+ \mid 3 \mid x\}$ and $T = \{x \in \mathbb{Z}^+ \mid 6 \mid x\}$.

   (a) Is $R \subseteq S$?
   (b) Is $R \subseteq T$?
   (c) Is $T \subseteq R$?
   (d) Is $T \subseteq S$?
   (e) What is $R \cap S \cap T$?

6. (2 points) Is the following statement true or false?

   For all sets $A$ and $B$, $A \subseteq B$ if and only if $A - B = \emptyset$. 