Practice Problems for Midterm

Practice Problems from Textbook:

Chapter 1:	**Chapter 2:**	**Chapter 3**
§ 1.2 # 7, 8	§ 2.2 # 2, 3, 5	§ 3.2 # 2, 8
§ 1.4 # 1 (parts 1, 2)	§ 2.4 # 4	§ 3.3 # 1, 3, 9
§ 1.5 # 7	§ 2.5 # 5	

Additional Problems:

1. Show that the following argument is valid with a two-column proof.

$$\begin{array}{l} A \to (B \vee C) \\ \neg B \\ \neg C \\ \hline \neg A \end{array}$$

2. Show that the following argument is not valid.

$$\begin{array}{l} L \to N \\ \neg N \to P \\ \neg P \\ \hline L \end{array}$$

3. Let n and m be integers.

   (a) Prove that if $2|n$ and $3|m$, then $6|(3n + 2m)$.

   (b) Prove that if $n|m$, then $n^2|m^2$.

   (c) Prove that $n^2 - n$ is even.

   (d) Prove that if 6 does not divide $2n$, then 3 does not divide n.

4. Let x be a non-zero rational number and let y be an irrational number. Prove that $\frac{x}{y}$ is irrational.

5. Let $A = \{1, 2, 3, 8, 9\}$, $B = \{3, 4, 5, 6, 9\}$, and $C = \{6, 7, 8, 9\}$. Find each of the following sets.

   (a) $(A \cup B) \cap C$

   (b) $A - (B \cap C)$

   (c) $\mathcal{P}(C - A)$

   (d) $(A - B) \times (C - B)$

6. Prove or give a counterexample for each of the following statements.

   (a) Let A, B, C be sets. Then $(A \cup B) \cap C \subseteq A \cup (B \cap C)$.

   (b) Let A, B, C be sets. Then $A - (B \cap C) = (A - B) \cap (A - C)$.

7. Let A, B, C, D be sets. Prove that $(A - B) \cup (C - D) \subseteq (A \cup C) - (B \cap D)$.