MAT 147
Homework # 3

1. For each correspondence below, answer the following questions: 1) Is it a function? 2) Is it onto? 3) Is it one-to-one?

(a) $f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = x^4$.

(b) $g : \mathbb{N} \to \mathbb{N}$ given by $g(n) = n + 1$.

(c) $h : \{1, 2\} \to \{a, b, c\}$ given by $h(1) = a$, $h(1) = b$, and $h(2) = c$.

(d) $k : \mathbb{R} \to \{4\}$ given by $k(x) = 4$.

2. Which of the following are propositions?
(a) All men are mortal.
(b) What a surprise!
(c) The millionth digit in the decimal expansion of $\sqrt{3}$ is 5.
(d) Every goople is an aardling.
(e) The moon is made of green cheese.

3. Let P and Q be propositions. Make a truth table to show that the propositions $\sim (P \wedge Q)$ and $\sim P \vee \sim Q$ are equivalent. (That is, verify that their columns in the truth table are identical).

4. "NOR" circuits are commonly used as a basis for flash memory chips. If P and Q are propositions, then P NOR Q is defined to be the negation of $P \vee Q$. Make a truth table for P NOR Q.

5. Let $A = \{0, 2, 4, 6, 8, 10\}$, $B = \{1, 3, 5, 7\}$, $C = \{0, 1, 3, 4, 6, 7\}$, and $D = \{0, 1, 2, 4, 5, 6, 7, 8, 9\}$. Find each of the following:

(a) $A \cup B$

(b) $A - B$

(c) $(A - B) - C$

(d) $(A \cap C) \cap D$

(e) $(B \cap C) \cup (C \cap D)$