Discrete Structures Homework 1

Show your work to receive full credit.

Section 1.1

2. Which of these are propositions? What are the truth values of those that are propositions?
a) Do not pass go.
b) What time is it?
c) There are no black flies in Maine.
d) $4 + x = 5$.
e) The moon is made of green cheese.
f) $2n \geq 100$.

4. What is the negation of each of these propositions?
a) Jennifer and Teja are friends.
b) There are 13 items in a baker's dozen.
c) Abby sent more than 100 text messages every day.
d) 121 is a perfect square.

8. Let p and q be the propositions.
p : I bought a lottery ticket this week.
q : I won the million dollar jackpot.
Express each of these propositions as an English sentence.

a) $\neg p$	b) $p \vee q$	c) $p \rightarrow q$	d) $p \wedge q$
e) $p \leftrightarrow q$	f) $\neg p \rightarrow \neg q$	g) $\neg p \wedge \neg q$	h) $\neg p \vee (p \wedge q)$

16. Determine whether these biconditionals are true or false.
a) $2 + 2 = 4$ if and only if $1 + 1 = 2$.
b) $1 + 1 = 2$ if and only if $2 + 3 = 4$.
c) $1 + 1 = 3$ if and only if monkeys can fly.
d) $0 > 1$ if and only if $2 > 1$.

22. Write each of these statements in the form "if p, then q" in English. [Hint: Refer to the list of common ways to express conditional statements provided in this section.]
a) It is necessary to wash the boss's car to get promoted.
b) Winds from the south imply a spring thaw.
c) A sufficient condition for the warranty to be good is that you bought the computer less than a year ago.
d) Willy gets caught whenever he cheats.
e) You can access the website only if you pay a subscription fee.
f) Getting elected follows from knowing the right people.
g) Carol gets seasick whenever she is on a boat.

28. State the converse, contrapositive, and inverse of each of these conditional statements. Be sure to label them so it's clear which one is the converse, contrapositive, and the inverse.
a) If it snows tonight, then I will stay at home.
b) I go to the beach whenever it is a sunny summer day.
c) When I stay up late, it is necessary that I sleep until noon.

32. Construct a truth table for each of these compound propositions.

a) $p \rightarrow \neg p$	b) $p \leftrightarrow \neg p$
c) $p \oplus (p \vee q)$	d) $(p \wedge q) \rightarrow (p \vee q)$
e) $(q \rightarrow \neg p) \leftrightarrow (p \leftrightarrow q)$	f) $(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$

34. Construct a truth table for each of these compound propositions.

a) $p \oplus p$ b) $p \oplus \neg p$

c) $p \oplus \neg q$ d) $\neg p \oplus \neg q$

e) $(p \oplus q) \vee (p \oplus \neg q)$ f) $(p \oplus q) \wedge (p \oplus \neg q)$