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) $2^n \geq 100$.

10. 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)** $p \to q$
d) $p \wedge q$ **e)** $p \leftrightarrow q$ **f)** $\neg p \to \neg q$
g) $\neg p \wedge \neg q$ **h)** $\neg p \vee (p \wedge q)$

14. Let p, q, and r be the propositions

p: You have the flu.
q: You miss the final examination.
r: You pass the course.

Express each of these propositions as an English sentence.

a) $p \to q$ **b)** $\neg q \leftrightarrow r$
c) $q \to \neg r$ **d)** $p \vee q \vee r$
e) $(p \to \neg r) \vee (q \to \neg r)$ **f)** $(p \wedge q) \vee (\neg q \wedge r)$

30. State the converse, contrapositive, and inverse of each of these conditional statements.

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.

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

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