Study Guide for Discrete Math

1) What is the negation of the propositions in "Abby has more than 300 friends on facebook"

2) Write the truth table for the proposition $\neg(r \rightarrow \neg q) \vee (p \wedge \neg r)$.

3) Write the statement in the form "If . . . , then . . . ." "It is hot whenever it is sunny."

4) Using c for "it is cold" and d for "it is dry", write "It is neither cold nor dry" in symbols.

5) Suppose that Q(x) is "x+1 = 2x", where x is a real number. Find the truth value of the statement. " $\forall x\, Q(x)$

6) P(x, y) means "x+2y = xy", where x and y are integers. Determine the truth value of the statement. $\forall x \exists y\, P(x, y)$

7) suppose the variable x represents students and y represents courses, and:
$U(y)$: y is an upper-level course $M(y)$: y is a math course $F(x)$: x is a freshman
$B(x)$: x is a full-time student $T(x, y)$: student x is taking course y.
Write the statement using these predicates and any needed quantifiers.

"Every freshman is a full-time student."

8) A student is asked to give the negation of "all bananas are ripe".
    A. The student responds "all bananas are not ripe". Explain why the English in the student's response is ambiguous.
    B. Another student says that the negation of the statement is "no bananas are ripe". Explain why this is not correct.
    C. Another student says that the negation of the statement is "some bananas are ripe". Explain why this is not correct.
    D. Give the correct negation.

9)

Determine whether the following argument is valid:

$$\begin{array}{l} p \rightarrow r \\ q \rightarrow r \\ \underline{q \vee \neg r} \\ \therefore \neg p \end{array}$$

10) Determine whether the following argument is valid:

She is a Math Major or a Computer Science Major.
If she does not know discrete math, she is not a Math Major.
If she knows discrete math, she is smart.
She is not a Computer Science Major.
Therefore, she is smart.

11) Consider the following theorem: "if x and y are odd integers, then x + y is even". Give a direct proof of this theorem.

12) Give a proof by contradiction of the following: "If n is an odd integer, then n^2 is odd".

13) Consider the following theorem: If n is an even integer, then n + 1 is odd. Give a proof by contraposition of this theorem.

14) Prove: if m and n are even integers, then m*n is a multiple of 4.