Due in class on Monday, February 20

(1) Which of the following are statements?
      (i) Is 2 a positive integer?
      (ii) $x^2 + x + 1 = 0$
      (iii) Study logic.
      (iv) There will be snow in January.
      (v) If stock prices fall, the I will lose money.

(2) Give the negation of each of the following statements.
      (i) $2 + 7 \leq 11$
      (ii) 2 is an even integer and 8 is an odd integer.
      (iii) It will rain tomorrow or it will snow tomorrow.
      (iv) If you drive, then I will walk.

(3) In Problems (i) through (viii), use $P(x)$: x is even; $Q(x)$: x is a prime number; and $R(x, y)$: $x+y$ is even. The variables x and y represent integers. Write an English sentence corresponding to each of the following, and determine the truth value of each statement.
      (i) $\forall x\, P(x)$
      (ii) $\exists x\, Q(x)$
      (iii) $\forall x\, \exists y\, R(x, y)$
      (iv) $\exists x\, \forall y\, R(x, y)$
      (v) $\forall x\, \neg Q(x)$
      (vi) $\exists y\, \neg P(y)$
      (vii) $\neg(\exists x\, P(x))$
      (viii) $\neg(\forall x\, Q(x))$

(4) Let p, q and r be the statements.
      p: I will study Mathematical Structures
      q: I will go to a movie
      r: I am in a good mood.
      Express each of these statements as an English sentence.

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

(5)   (i) If $p \to q$ is false, can you determine the truth value of $\neg(p \wedge q) \to q$? Explain your answer.
      (ii) If $p \to q$ is true, can you determine the truth value of $\neg p \vee (p \to q)$? Explain your answer.