Math 220/970(HNR) − Homework 1

Due Wednesday 09/09 at the beginning of class

PART A

Problems from the textbook:

- Section 1.1 # 1(b,c,f,h,i,k); 2(b,c,e,f,h); 5(b,c,e,f).

- Section 1.2 # 3, 5(b,c,e,f); 13c

- Section 1.3 # 3(b,c,d)

PART B

1. State the negation for each of the following statements.

    (a) $\sqrt{3}$ is a rational number.
    (b) 0 is not a negative number.
    (c) The real number r is at most $\sqrt{3}$
    (d) Two sides of a triangle have the same length.
    (e) The point P on the plane lies outside of the circle C.

2. Prove that the statement $\neg((\neg Q \wedge (P \Rightarrow Q)) \Rightarrow (\neg P))$ is a tautology, a contradiction, or neither. You must state which of the three it is as well as give the proof.

3. In each of the following statements identify the hypothesis (assumption) and conclusion. Represent your answers in the following form:

   Hypothesis:
   Conclusion:

    (a) If a is irrational, then $2a$ is irrational.
    (b) n^2 is odd whenever n is an odd integer.
    (c) In order to pass the drivers test, the candidate must be able to parallel park.

4. Consider the statements: P : 2015 is even, and Q : 29 is prime. Write each of the following statements in words and indicate whether it is true or false.

    (a) $\neg P$.   (b) $P \vee Q$.   (c) $P \wedge Q$.   (d) $P \Rightarrow Q$.

5. Write the following statement using "if, then":

   "A sufficient condition for a triangle to be isosceles is that it has two equal angles."

6. For the open sentence $P(x) : 3x - 2 > 4$ over the domain $\mathbf{Z}$, determine:

    (a) the values of x for which $P(x)$ is a true statement.
    (b) the values of x for which $P(x)$ is a false statement.

7. For the open sentence $P(x) : x(x - 1) = 6$ over the domain $\mathbf{R}$, determine:

    (a) the values of x for which $P(x)$ is a true statement.
    (b) the values of x for which $P(x)$ is a false statement.