Math 211

First Hour Exam

Name _____

Friday, September 23
100 pts.

1.   (10 pts.) Let p be the statement "It is nice Saturday" and q the statement "I go to the fair". Translate the following into symbolic form:

   a)   It is nice Saturday and I go to the fair.

   b)   If it is nice Saturday then I go to the fair.

   c)   I go to the fair only if it is nice Saturday.

2.   (10 pts.) Given the statement "If it is nice Saturday then I go to the fair." What is the

   Sufficient condition?

   Necessary condition?

   Converse?

   Contrapositive?

3.   (10 pts.) Simplify the following expressions by moving the negation sign inside so that it appears only directly before the predicate expression(s) and so that only **and**, **or**, and **not** are used in addition to the predicates and quantifiers (that is, translate implication statements using these three symbols). Also remove any double negations.

$\neg \exists x (P(x) \lor Q(x))$

$\neg \forall x (G(x) \rightarrow \neg B(x))$

4.   (10 pts.) Construct a truth table for the expression $((p \rightarrow q) \land q) \rightarrow p$.
Please show your work.

5. (5 pts.) Let S(x) be the statement "x is a student", H(x) be the statement "x studies hard", and P(x) be the statement "x passes the exam". Translate into predicate logic the statement "All students who study hard pass the exam".

6. (5 pts.) Let D(x,y) be the statement "x requests y", P(x) the statement "x is a process", R(x) the statement "x is a resource", L(x, y) the statement "x is locked by process y", and W(x) the statement "x goes into a wait state". **Translate** into English the statement

    $$\forall x \forall y ((P(x) \wedge R(y) \wedge D(x,y) \wedge \exists z(P(z) \wedge L(y,z))) \Rightarrow W(x))$$

    (transliterations not accepted)

7. (15 pts.) Suppose that set A = {a, c, d}, and that B = {c, e}. What is the result of

$A \bigcup B$

$A \bigcap B$

$A - B$

$A \times B$

8. (10 pts.) Prove that $A \bigcap B \subset A$

9. (10 pts.)   Give a formal definition of the assertion that "f is O(g)". What does it mean?

10.   (10 pts.)   Give a brief definition of an algorithm.

11   (5 pts.) Say something about one of the following:

   a. Donald Knuth
   b. George Boole
   c. Abu Ja'far Mohammed Ibn Musa Al-Khowarizmi
   d. Paul Gustav Heinrich Bachmann