

Math 211

First Hour Exam

Name _____

Friday, September 22
95 pts. (will be normalized to 100 in the grade book)

1. (10 pts.) Let p be the statement “I study hard” and q the statement “I pass the exam”. Translate the following into symbolic form:

a) If I study hard then I pass the exam.

b) I did not study hard but I passed the exam.

c) I pass the exam only if I study hard.

2. (10 pts.) Given the statement “If two lines are parallel then they (the two lines) never meet” What is the

Sufficient condition?

Necessary condition?

(problem #2 continued)

Converse?

Contrapositive?

3. (10 pts.) Simplify the following expressions by moving the negation sign inside so that it appears only directly before predicate expression(s) $P(x)$ and $Q(x)$ 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.

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

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

4. (10 pts.) Complete the following truth table for the expression $((p \rightarrow q) \wedge \neg p) \rightarrow \neg q$. Is the expression a tautology?

p	q	$\neg p$	$\neg q$	$p \rightarrow q$	$((p \rightarrow q) \wedge \neg p)$	$((p \rightarrow q) \wedge \neg p) \rightarrow \neg q$

5. (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”, $A(y)$ the statement “y is available”, and $W(x)$ the statement “x goes into a wait state”. **Translate** into predicate form the statement "If process x requests resource y and y is not available then process x goes into a wait state."

6. (5 pts.) Let $M(x)$ stand for the statement "x is a message", $MB(x)$ for the statement "x is a mailbox", $T(x,y)$ for "x is sent to y", and $S(x,s)$ for "the status of x is s", translate into English the statement
 $\forall x \forall y ((M(x) \wedge MB(y) \wedge T(x,y) \wedge S(y, full)) \rightarrow S(x, fail))$

7. (5 pts.) Give a proof of the following, giving reasons for each step.

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

$$B(Charlie)$$

$$\therefore \neg A(Charlie)$$

8. (15 pts.) Suppose that set $A = \{3,7\}$, and that $B = \{2,7,9\}$. What is the result of

$A \cup B$

$A \cap B$

$A - B$

$A \times B$

9. (10 pts.) Prove that $A \cup (A \cap B) = A$
10. (10 pts.) What is 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. René Descartes
 - e. Charles Dodgson
 - f. Ada Augusta, Countess of Lovelace