Name:

Spring 2010 Math 245-2 Exam 1

Please read the following directions:
Please write legibly, with plenty of white space. Please put your answers in the designated areas. To get credit, you must also show adequate work to justify your answers. If unsure, show the work. All problems are worth 5-10 points. You may use your book and/or notes, but no calculators or other aids. This exam will last 60 minutes; pace yourself accordingly. If you are done early, you may leave – but NOT during the last five minutes of the exam, during which you are asked to remain quiet and in your seat. Good luck!

Problem	Min Score	Your Score	Max Score
1.	5		10
2.	5		10
3.	5		10
4.	5		10
5.	5		10
6.	5		10
7.	5		10
8.	5		10
9.	5		10
10.	5		10
Total:	50		100

Problem 1. For each of the following, indicate which, if any, of the following definitions apply: proposition, compound proposition, universal conditional proposition, quantified proposition, and/or predicate. Note: more than one may apply.

a. The sun orbits the earth.

b. If the sun orbits the earth then the Saints won the Super Bowl.

c. $x > 3$

d. $\forall x \in \mathbb{Z}, (x > 3) \rightarrow (x > 5)$

e. $\exists x \in \mathbb{Z}, (x > 3) \rightarrow (x > 5)$

Problem 2. Starting with the base statement "Every polynomial with at least two zeroes is continuous.", supply each of the following. Simplify your answers.

a. contrapositive

b. converse

c. inverse

d. negation

Problem 3. (1.10 in text) Write the negation of the proposition $\forall x \in \mathbb{R}, 0 \geq x > -5$. Be sure to use De Morgan's laws to simplify your result.

Problem 4. (4.13 in text) Write the negation of the proposition $\exists x \in \mathbb{R},\ \forall y \in \mathbb{R}, x + y = 0$.

Problem 5. (3.3 in text) Use a truth table to determine whether this argument is valid:

$$\begin{array}{rr} & p \rightarrow q \\ & q \rightarrow p \\ \therefore & p \vee q \end{array}$$

Problem 6. (1.13 in text) Use a truth table to determine whether $(p \oplus q) \oplus r \equiv p \oplus (q \oplus r)$.

Problem 7. Find a proposition using only combinations of $p, q, \vee, \sim$, that is logically equivalent to $p|q$.

Problem 8. Convert the number 256_{16} to base two and to base ten.

Problem 9. Fill in the missing justifications, including line numbers, for the following proof.

1.	$(p \wedge q) \vee r$	hypothesis
2.	$t \to \sim s$	hypothesis
3.	$r \to s$	hypothesis
4.	$\sim s$	
5.	$\sim r$	
6.	$p \wedge q$	
7.	$\therefore p$	

Problem 10. Give a complete proof (from hypotheses to conclusion) that uses both universal modus ponens and conjunctive addition.