Code Name:

Fall 2009 Math 245 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 50 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. Carefully define the following terms:

a. inverse

b. modus tollens

c. syntax

d. semantics

e. tautology

Problem 2. Simplify $\sim \forall x \exists y \exists z\ x + y \leq z$, to eliminate $\sim$.

Problem 3. Simplify $\sim\big((p\vee\sim q)\wedge(r\vee(\sim s\wedge t))\big)$ as much as possible, so that no compound proposition is negated.

Problem 4. (1.11 in text) Show that the proposition $s = (p \wedge q) \vee (\sim p \vee (p\wedge \sim q))$ is a tautology.

Problem 5. (3.4 in text) Use a truth table to determine whether this argument is valid:

$$\begin{array}{r} p \\ p \rightarrow q \\ \sim q \vee r \\ \therefore \quad r \end{array}$$

Problem 6. (2.3 in text) Construct the truth table for the proposition $(p \rightarrow r) \leftrightarrow (q \rightarrow r)$.

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

Problem 8. Convert the number BAD_{16} to base 2 and to base 10.

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

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

Problem 10. All bizzles are azzles, but not all azzles are bizzles. There is at least one cozzle that is also a bizzle. There is at least one dizzle that is not a bizzle. All cozzles are dizzles. Must there be a dizzle that is also an azzle?