Math 2534 Test 1B Fall 2013   Name _____
No Electronic Devices. Show all work to get complete credit.

Problem 1:(18pts) Use Algebra of Logic to simplify the following and justify each step.

$$[\sim (p \wedge \sim q) \wedge q] \rightarrow \sim p \equiv q \rightarrow \sim p$$

Problem 2: (18pts) Prove the following: You may use theorems we have proved about prime numbers BUT NOT theorems about even and odd numbers. (Use only definitions.)

Theorem: The product of two prime integers each greater than 2 is always odd.

Problem 3: (18pts) Use method of **Contradiction** to prove the following theorem. Your write up needs to be clear concise and well documented with a good conclusion. Use definitions only.

Theorem: If n is a natural number, if x^2 is even then $x+5$ is odd.

Problem 4: (12pts) Given the following true statements:
1) John is smart.
2) John or Mary is 20 years old.
3) If Mary is 20 years old, then John is not smart.

Put the above statements into symbolic logic and define all variables used.
Determine if the following statement is true or false. Justify your conclusion in a clear presentation.   **John is not smart or Mary is not 20 years.**

Problem 5: (8pts)

Convert the following into a natural conversational English sentence.

Let x be an element in the domain D of all student clubs
Let y be an element in the domain C of all students
The predicate $P(x,y) = y$ joins x
$\exists y \in C \mid \forall x \in D, P(x, y)$

Problem 6: (18pts) Use method of **Contrapositive** to prove the following theorem. Your write up needs to be clear, concise, and well documented with a good conclusion using definition only.

Theorem: If the sum of a + b is irrational then a or b is irrational.

Problem 7: (8pts) Use the Division Algorithm /Quotient Remainder Theorem to answer the following problem:

The integers can be portioned into five distinct groups using $Z \bmod 5$. State the five groups and determine which group would contain the integer n = 52.

Pledge: I have neither given nor received help on this test.

Signature_____