**DSMA-B Assignment 1 Questions**

**MT**

1. i) Prove or disprove that the product of a nonzero rational number and an irrational number is irrational.

ii) Prove that if m and n are integers and mn is even, then m is even or n is even.

2. “Ramesh failed in Mathematics, but attended every class;” “everyone who submitted the assignments every week passed in Mathematics;” “if a student passed in Mathematics, then he/she submitted some of the assignments.” Can we conclude that “every student missed at least an assignment”?

3. Use rules of inference to show that if the premises

∀x(P(x) → Q(x)), ∀x(Q(x) → R(x)), and ¬R(a),

where a is in the domain, are true, then the conclusion

¬P(a) is true. Given same premises except the last one now given as R(a), then what about ¬P(a)? Is it true or false.

4. Show that C, the set of complex numbers has the same cardinality as R, the set of real numbers.

5. Determine whether the set of integers divisible by 5 but not by 7 is countable or uncountable. For those that are countable exhibit one to one correspondence between the set of natural numbers and the set.

6. Consider the sequence = 1, = 2, = 3, and Prove that for all n.