REVIEW #1

1. Informally show that there are infinitely many Turing machines which not only diverge on infinitely many inputs, but also halt for infinitely many inputs.

2. Informally show that there are infinitely many Turing machines which diverge on infinitely many inputs, but halt for finitely many inputs.

3. Informally show why the number of total functions is greater than the number of Turing machines.

4. Suppose that the sets A, B, and their complements A', B', are recursively enumerable (r.e.). Is the set C = A' union B recursive ? Present a formal proof.

5. Suppose that the set D is only r.e. Is the set E = D union D' recursive ?

6. Show that for any positive integer k, the line segment (1/2k, 1/k) contains uncountably many irrational numbers.

7. Informally prove the statement: "A Turing machine cannot verify the divergence of another Turing machine." (One paragraph limit !).

8. Is the number of total functions from N to {1} greater than the number of recursive functions ? Justify your answer.

9. Is the cardinality of the set of partially recursive functions greater than the cardinality of the set of recursive functions ? Justify your answer.

10. Can a set and its complement BOTH be non-r.e. ? Justify your answer.

11. Is the set L = { i such that M _ i accepts only one string} an r.e. set ?

12. Formally show that the set K has an undecidable membership problem.

13. How would one go about proving that a given set is not computable (r.e.) ?