Cpt S 317 Homework #10

Please print your name!

1. (1). Show that if both L and (the complement) $\overline{L}$ are r.e., then L is recursive. (2). Show that r.e. languages are not closed under complement.

2. Show that recursive languages are closed under complement.

3. Recall that we use M_i to denote the "i-th Turing Machine". That is, the string encoding $\langle M_i \rangle$ of M_i is exactly w_i, the i-th word in the dictionary ordering. Show that, for each Turing machine M, there are infinitely many i such that $L(M) = L(M_i)$ (i.e., M and M_i accept the same language.). (If a program is understood as a Turing machine, what does this exercise say about the program?)

4. For a TM M, a L-instruction (resp. R-instruction) is a move in the form of $\delta(q, a) = (p, b, L)$ (resp. $\delta(q, a) = (p, b, R)$). Show that the following problem is **decidable**:

Given a TM M, whether M contains the same number of L-instructions and R-instructions?

5. Show that the following problem is also **decidable**:

Given a TM M, whether there exists a TM M' such that M' contains the same number of L-instructions and R-instructions, and $L(M') = L(M)$?