CS 280: Homework 8

Date of Handout: 19 Nov 99
Due Date: 24 Nov 99 in class
Due date is th WEDNESDAY before thanksgiving

Problem 1: *(5 points)* Assume that all possible Turing machines are written down in the sequence $M_1, M_2, M_3, \ldots$. Assume that all strings of finite length are written down without any repetitions in the sequence $w_1, w_2, w_3, \ldots$ Prove that the language

$$L_d = \left\{ w_i \middle| M_i \text{ does not accept } w_i \right\}$$

is not r.e. (This is Lemma 8.1 in the text and was discussed in class.)

Problem 2: Assume there is an algorithm to decide if two Turing machines M_1 and M_2 accept exactly the same language. Use that algorithm to construct

(a) *(10 points)* an algorithm to decide if the language accepted by a Turing machine M is empty,

(b) *(10 points)* an algorithm to decide if a Turing machine M accepts a string w (this is L_u in the text).

(5 points) Argue that no algorithm can tell if two C programs perform the same task in possibly different ways.

Problem 3: *(10 points)* Assume there is an algorithm to decide if a Turing machine M accepts a string w (this is L_u in the text). Use this to give an algorithm to decide if a Turing machine M halts on the input w (this is the halting problem).