CSE 431 Spring 2012
Assignment #4

Due: Friday, April 27, 2012

Reading assignment: Finish reading Chapter 5 of Sipser's text. You may also want to skim section 6.3 of the text.

Problems:

1. Show that for all Turing-recognizable problems A, $A \leq_m A_{TM}$.

2. Sipser's text (1st edition problem 5.10; 2nd edition problem 5.24).

3. Show that A is decidable if and only if $A \leq_m 0^*1^*$.

4. Show that there is an undecidable language contained in 1^*.

5. Which of the following problems are decidable? Justify each answer:

   (a) Given Turing machines M and N, is $L(N)$ the complement of $L(M)$?

   (b) Given a Turing machine M, integers a and b and an input x, does M run for more than $a|x|^2 + b$ steps on input x?

6. (Bonus) Show that the following problem is undecidable: Given a Turing machine M and integers a and b, does there exist an input x on which M runs for more than $a|x|^2 + b$ steps on input x?