CSE 431 Spring 2006
Assignment #6

Due: Friday, May 19, 2006

Reading assignment: Read Sections 7.4 and 9.3 of Sipser's text.

Problems:

1. Sipser's text: Problem 7.12 (both editions).

2. Show that A_{TM} is NP-hard.

3. Sipser's text: Problem 7.17 (both editions).

4. Let $U = \{\langle M, x, \#^t \rangle \mid M$ is an NTM that accepts input x within t steps$\}$. Show that U is NP-complete.

5. Show that if $P = NP$, a polynomial time algorithm exists that produces a satisfying assignment when given a satisfiable Boolean formula. (Note: The algorithm you are asked to provide computes a function, but NP contains languages, not functions. The $P = NP$ assumption implies that SAT is in P, so testing satisfiability is solvable in polynomial time. However, the assumption doesn't say how this test is done and the test may not tell what such an assignment might be. You must show that you can find them anyway. Hint: Use the satisfiability tester repeatedly to find the assignment bit by bit.

6. (Bonus) Recall that a 2-CNF formula is a CNF formula in which each clause has at most 2 literals and that 2-$SAT = \{\langle \phi \rangle \mid \phi$ is a satisfiable 2-CNF formula$\}$. Show that $2SAT \in P$.