CSE 531: Computability and Complexity
Assignment #3
October 18, 2001
due: Thursday, October 25

1. Exercise 5.4. Prove it is true, or give a counterexample.

2. Exercise 5.6.

3. Problem 5.19. Note that this is a mapping reduction. Give a careful proof that P has a match if and only if G is ambiguous.

4. Problem 5.20, part b. Hint: consider accepting computation histories. (Read part a just to see the interesting contrast to A_{TM} and E_{TM}.)

5. Problem 5.22. This very general result subsumes many other undecidability results about Turing machines, which makes it very powerful. For instance, Theorem 5.2, Theorem 5.3, and Problem 5.12 all follow as immediate corollaries of Rice's Theorem.

   Hint: Let M_{Σ^*} be a Turing machine with $q_0 = q_{\text{accept}}$ and no transitions. What language does M_{Σ^*} accept? You can assume that $< M_{\Sigma^*} > \in P$, since otherwise you could instead argue that $\overline{P}$ is undecidable, switching the roles of M_1 and M_2 in part b of the problem statement. Now mimic the proof of Theorem 5.3 to prove $A_{TM} \leq_m P$.