CSE 431: Theory of Computation
Assignment #3
April 14, 2000
due: Monday, April 24

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

2. Exercise 5.6.

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

4. Problem 5.20, part b. Hint: consider accepting computation histories.

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, reducing A_{TM} to P. As part of the reduction, be sure to include a careful proof that S accepts $< M, w >$ if and only if M accepts w, where S is the decider for A_{TM}, as was done in lectures.