Due: Tuesday, 4/15/2008 before class

1. A *queue automaton* is like a PDA, except that the stack is replaced by a queue. A *queue* is a tape allowing symbols to be written only on the left-hand end and read only at the right-hand end. Each write operation (a push) adds a symbol to the left-hand end of the queue and each read operation (a pop) reads and removes a symbol at the right-hand end. As with a PDA, the input is placed on a separate read-only input tape and the head on this input tape can only move left to right. The input contains a cell with a blank symbol following the input, so that the end of the input can be detected. A queue automaton accepts by entering a special accept state at any time. Show that a language can be recognized by a deterministic queue automaton if and only if the language is Turing-recognizable.

2. Show that the collection of decidable languages is closed under the operations of **(b)** concatenation, **(c)** star, **(d)** complementation, and **(e)** intersection.

3. **7.15** Show that NP is closed under the star operation.

4. **7.17** Show that if P=NP then every language $A \in$P, except $A = \emptyset$ and $A = \Sigma^*$ is NP-complete.

5. Show that 2SAT is polynomially solvable.

6. Describe an algorithm that you could implement right now, that is, you wouldn't need any special assumptions or knowledge about possible algorithms that are not known today, such that if P=NP, your algorithm would factor any integer in polynomial time.