CSE 322
Autumn Quarter 1998
Assignment 2
Due Friday, October 16

All solutions should be neatly written or type set.

1. (10 points) In this problem you start with a deterministic finite automaton and construct a nondeterministic satisfying a certain property. Explain why your construction works. It is very helpful to use concept of "reachability". In particular, for a DFA $M = (K, \Sigma, \delta, s, F)$ and a state $q \in K$ define $R(q) = \{p : (q, w) \vdash_M^* (p, e) \text{ for some } w \in \Sigma^*\}$. The set of states reachable from q is $R(q)$. If $M = (K, \Sigma, \delta, s, F)$ is a DFA, construct an NFA M' such that $L(M') = \text{suffix}(L(M))$. Recall that $\text{suffix}(L) = \{u : xu \in L \text{ for some } x \in \Sigma^*\}$.

2. (10 points) In this problem you will explore how NFAs can be more succinct than DFAs. Consider the languages $L_n = \{x0y : x, y \in \{0,1\}^* \text{ and } |y| = n\}$.

   (a) Demonstrate that there is an NFA with $n + 2$ states that accepts L_n.

   (b) Construct a DFA M_2 such that $L(M_2) = L_2$.

   (c) How many states do you think it takes a DFA to accept L_n? Construct a DFA M_n with that many states that acceps L_n.

3. (10 points) Use the subset construction to build a DFA equivalent to the following NFA. Give your answer as a state diagram where all the states are useful. That is, every state is reachable from the start state.