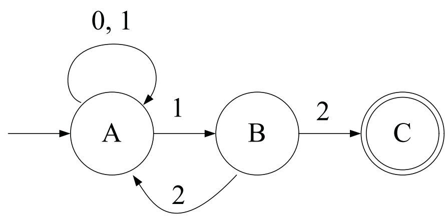
Problem Set 3

Problem 1. Using the procedure shown in class, convert the following NFA into a DFA for the same language.



Problem 2. For any language L let

$$\textit{noprefix}(L) = \{w \in L |\ \text{no proper prefix of } w \text{ is a member of } L\}$$

Prove or disprove: if L is DFA-acceptable then so is $\textit{noprefix}(A)$.

Problem 3. For $n \geq 0$, let $L_n = \{1^i : 0 \leq i < n\}$ (where $1^0 = \varepsilon$). Prove that there is a DFA M_n having n final states that accepts L_n. Then prove that L_n cannot be accepted by any DFA having fewer accept states.

Problem 4. Consider applying the product construction to NFAs $M_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$ and $M_2 = (Q_2, \Sigma, \delta_2, q_2, F_2)$ in order to show that the NFA-acceptable languages are closed under intersection.

Part A. Formally specify the product machine $M = (Q, \Sigma, \delta, q_0, F)$.

Part B. Does the construction work—that is, is $L(M) = L(M_1) \cap L(M_2)$? Informally argue your conclusion.