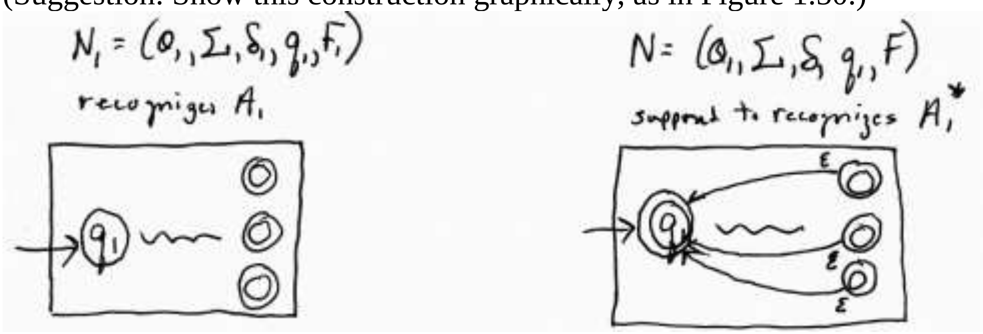
Theory of Computation, CSCI 438 spring 2022
Regular expressions describe regular languages, pg. 66-69, Jan. 28

1.15 Give a counter example to show that the construction fails to prove Theorem 1.49, the closure of the class of regular languages under the star operation.
Let $N_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$ recognize A_1. Construct $N = (Q_1, \Sigma, \delta, q_1, F)$ as follows.
N is supposed to recognize A_1^*.

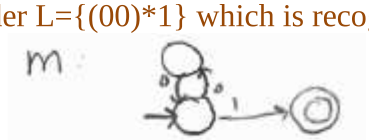
a. The state of N are the states of N_1.
b. The start state of N is the same as the start state of N_1.
c. $F = \{q1\} \cup F_1$.
   The accept states F are the old accept states plus its start state.
d. Define δ so that for any $q \in Q1$ and any $a \in \Sigma_\varepsilon$

$$\delta(q,a) = \begin{cases} \delta_1(q, a) & \text{for } q \notin F_1 \text{ or } a \neq \varepsilon \\ \delta_1(q, a) \cup \{q_1\} & \text{for } q \in F_1 \text{ and } a = \varepsilon \end{cases}$$

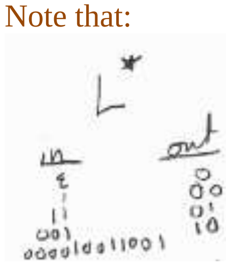
(Suggestion: Show this construction graphically, as in Figure 1.50.)



Consider L={(00)*1} which is recognized by:



Note that:



Using the construction described for finding a machine for L* gives:

However, $00 \in \mathcal{L}(M')$ but $00 \notin L^*$.

1.19 Use the procedure described in lemma 1.55 to convert the following regular expression to an NFA.

b. $(((00)^*(11)) \cup 01)^*$

Answer: