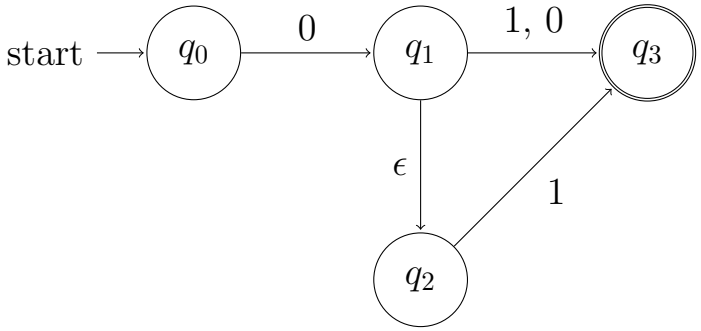
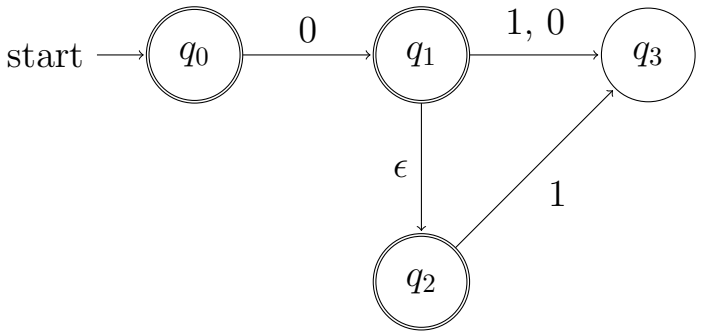
Problem 1a

NFA N:



The language of NFA N accepts the strings $\{01, 00\}$. After flipping the states we get the NFA M:



Which accepts the strings $\{\epsilon, 0\}$ which is not the complement of N.

Problem 1b

DFA's are closed under complement and NFA's and DFA's recognize the same class of languages. Therefore the class of languages recognized by an NFA are closed under complement.

Problem 2

A and B are regular languages. The complement of A and the complement of B both are closed under complement and thus will produce a language that is regular. The complement of that language, C, is also regular.

$$\overline{\overline{\mathbf{A}} \cup \overline{\mathbf{B}}} = \mathbf{C}$$

By DeMorgan's Law, we have the intersection of A and B. Thus, The class of regular languages are closed under intersection.

$$\mathbf{C} = \mathbf{A} \cap \mathbf{B}$$

Problem 3

A DFA M = $(Q, \sigma, \delta, q_0, F)$, recognizes a regular language A. We will construct an NFA N by switching the direction of the transition arrows, swapping the start and acceptance states, and adding ϵ transitions. We then have the NFA N = $(Q\prime, \sigma\prime, \delta\prime, q_0\prime, F\prime)$ which recognizes A^R.