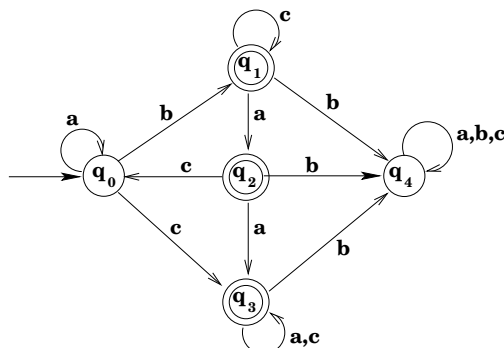*This homework is due in class on Friday, November 9.*

**1.** Consider the following DFA, whose input alphabet is $\Sigma = \{a, b, c\}$:

    a) Based on this diagram, give a table for the transition function of this DFA.

    b) For each of the following strings, what state is this DFA in after reading the string? Which strings are accepted by this DFA?

$$a, \; b, \; abc, \; aabaab, \; cccaaa, \; bbaabb, \; abac, \; \varepsilon$$

2. Find a DFA that accepts each of the following languages. Give your answers as state diagrams. Briefly explain in English how each DFA works.
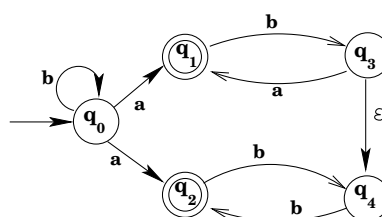
    a) $L_1 = \{w \in \{a, b\}^* \mid w \text{ begins and ends with the same symbol}\}$

    b) $L_2 = \{w \in \{0, 1\}^* \mid \text{the length of } w \text{ is a multiple of 3}\ \}$

    c) $L_3 = \{w \in \{a, b\}^* \mid w \text{ contains the substring } abab\ \}$

3. Using the algorithm from Section 3.5, convert each of the following NFA's into a DFA that accepts the same language.
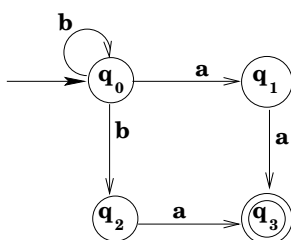
    a)   **b)**

4. For each of the following regular expressions over the alphabet $\{a, b\}$, find an NFA that accepts the same language that is generated by the regular expression. Use the algorithm from Section 3.6.

    a) $(aa + bb)^*$ **b)** $(a + b)aa(a + b)^*$

5. Let L be any regular language over an alphabet Σ. Give an argument to show that L^R is also a regular language.