This homework, on Section 3.4 and the start of 3.5, is due on Wednesday, November 4.

1. For each of the following languages, draw a transition diagram for a DFA that accepts the language. That is, it accepts all the strings in the language and no other strings. (The alphabet for the DFA is the same as the alphabet for the language.)

a) $\{w \in \{a,b\}^* \mid n_a(w) + n_b(w)$ is a multiple of 3$\}$

b) $\{w \in \{a,b,c\}^* \mid n_a(w) + n_b(w)$ is **not** a multiple of 3$\}$ [Note the alphabet!]

c) $\{w \in \{a,b,c\}^* \mid w$ contains a c and there are no a's after the first $c\}$

d) $\{w \in \{0,1\}^* \mid w$ begins and ends with different symbols$\}$

e) $\{w \in \{a,b\}^* \mid w$ contains the string abab$\}$

2. Suppose that a DFA M is defined as $M = (Q, \Sigma, p_1, \delta, F)$, where:

$$Q = \{p_1, p_2, p_3, p_4\} \qquad \Sigma = \{a, b, c\} \qquad F = \{p_2, p_4\}$$

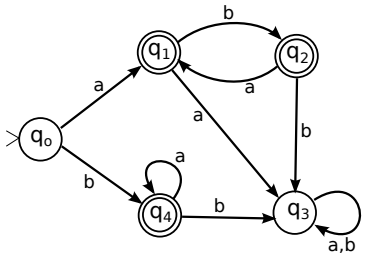
and δ is given by the table

	p_1	p_2	p_3	p_4
a	p_2	p_2	p_3	p_3
b	p_4	p_3	p_3	p_4
c	p_1	p_3	p_3	p_4

a) Draw a transition diagram for M.

b) Based on your diagram, write a regular expression for the language that is accepted by M, and briefly explain your reasoning.

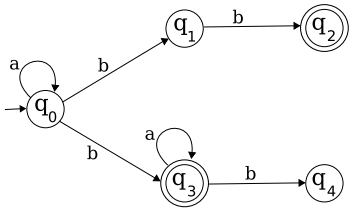
3. Consider the DFA that is defined by the transition diagram shown at the right.

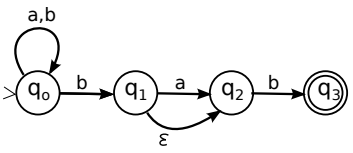


a) Suppose that this DFA is given formally as $M = \{Q, \Sigma, q_o, \delta, F\}$. Identify Q, Σ, δ, and F. For δ, give the transition table.

b) Find a regular expression for the language that is accepted by this DFA. Explain your reasoning.

4. Consider the two NFAs that are defined by the following transition diagrams:





Which of the following strings are accepted by the NFA on the **left**? (Just list the accepted strings.) Find a regular expression for the language that is accepted by the NFA on the left. Explain your reasoning. Also answer exactly the same questions for the NFA on the **right**

a) *aaab* **b)** *aabb* **c)** *bb* **d)** *bbbbb* **e)** *baaab*
f) *bbb* **g)** *abaaa* **h)** *bab* **i)** *abab* **j)** *baaabab*