Problem 1
Sipser, 1.8a, 1.9b, 1.10c.

Problem 2
Sipser, 1.14.

Problem 3
Give regular expressions for the following languages over $\Sigma = \{a, b\}$:

a. $L =$ all strings do not contain the substring $ba$

b. $L = \{a^n b^m \mid n \geq 1, m \geq 1, nm \geq 3\}$ (nm is n times m)

c. $L =$ all strings containing a number of $a$s that is a multiple of 3.

Problem 4

Are the regular expressions over $\Sigma = \{a, b, c\}$ in each pair equivalent? Explain your answer. If the two are not equivalent, show a string that is in one language and not the other.

a. $(a \cup b)^* a^*$ and $((a \cup b)a)^*$

b. $((a \cup b)c)^*$ and $(ac \cup bc)^*$

c. $b(ab \cup ac)$ and $(ba \cup ba)(b \cup c)$

Problem 5

Let $L$ be the language denoted by the regular expression $((ba)^* \cup bb)(\varepsilon \cup b)$. Construct an NFA that recognizes $L$ using the procedure outlined in class. Show your steps.
Problem 6

Use the state elimination method to convert the following finite automaton to a regular expression. Please eliminate the states in this order: $q_3, q_1, q_2, q_0$. 