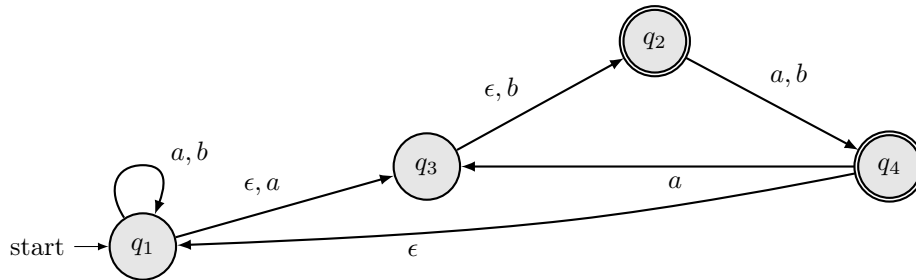# Homework Assignment 3

1. Convert the regular expression $(a^\star + \epsilon) \cdot b^\star$ into an NFA using the method from class. Present the answer as a state diagram.

2. Convert the following NFA into a regular expression using the method from class. Write the conversion step-by-step, enunciating which state you are compressing at each step.

3. Problem 1.31.

4. Convert the NFA in Exercise 2 into an equivalent NFA without epsilon transitions. Present the answer as a state diagram.

5. Which of the following languages is regular? If the language is regular, then give a state diagram DFA, a state diagram NFA, or a regular expression. If the language is not regular, prove that fact using the Pumping Lemma.

   (a) $L_1 = \{0^n 1^m \mid m \geq 0 \wedge n \geq 0 \wedge n < m\}$

   (b) $L_2 = \{w \mid w \in \{\mathtt{a}, \mathtt{b}\}^\star \wedge w \text{ has twice as many } \mathtt{a}\text{'s as } \mathtt{b}\text{'s}\}$