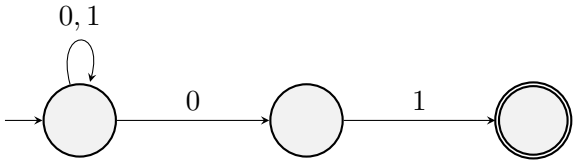
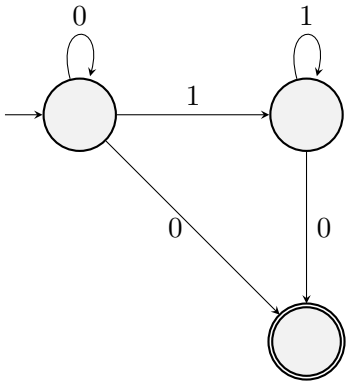
1. Create an NFA using three states recognizing the language consisting of all words on $\Sigma = \{0, 1\}$ ending in 01.

   Solution.

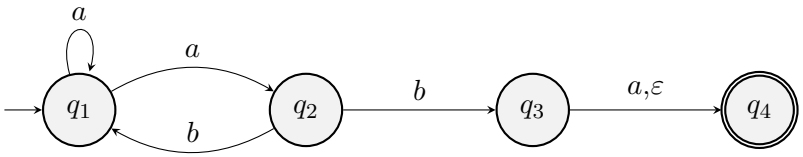


2. Create an NFA using three states recognizing the language $0^*1^*0^+$.

   Solution.



3. Consider the NFA



   (a) Is *abab* accepted? Explain.

   (b) What is $\delta(q_2, b)$?

   Solution.

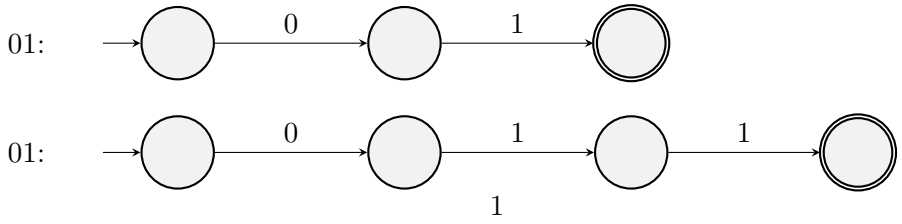
   (a) The word *abab* is accepted by the following path:

$$q_1 \xrightarrow{a} q_2 \xrightarrow{b} q_1 \xrightarrow{a} q_2 \xrightarrow{b} q_3 \xrightarrow{\varepsilon} q_4.$$

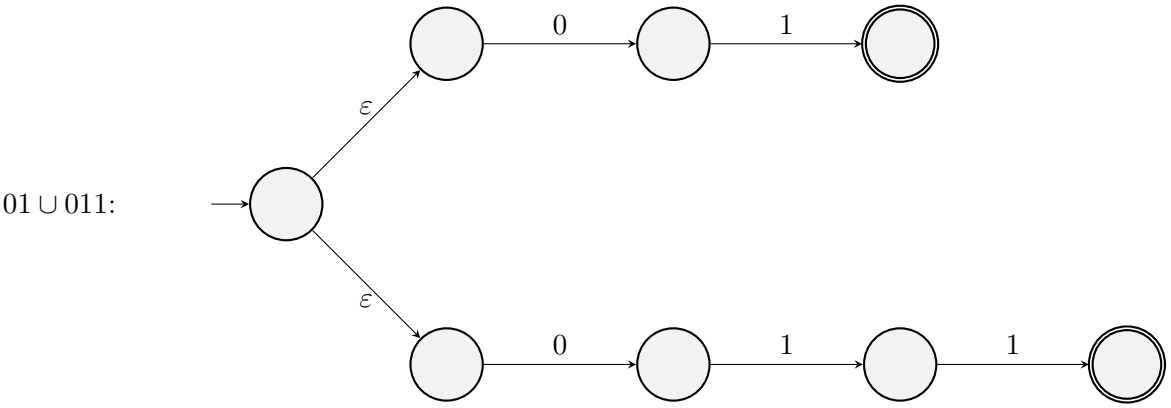
   (b) $\delta(q_2, b) = \{q_1, q_3, q_4\}$.

4. Create an NFA for the regular expression $(01 \cup 011)^*$ using the ideas presented in today's lecture: (i) find NFAs for 01 and for 011, (ii) combine them to get an NFA for $01 \cup 011$, and (iii) modify the NFA just constructed to find an NFA for $(01 \cup 011)^*$. *Solution.*

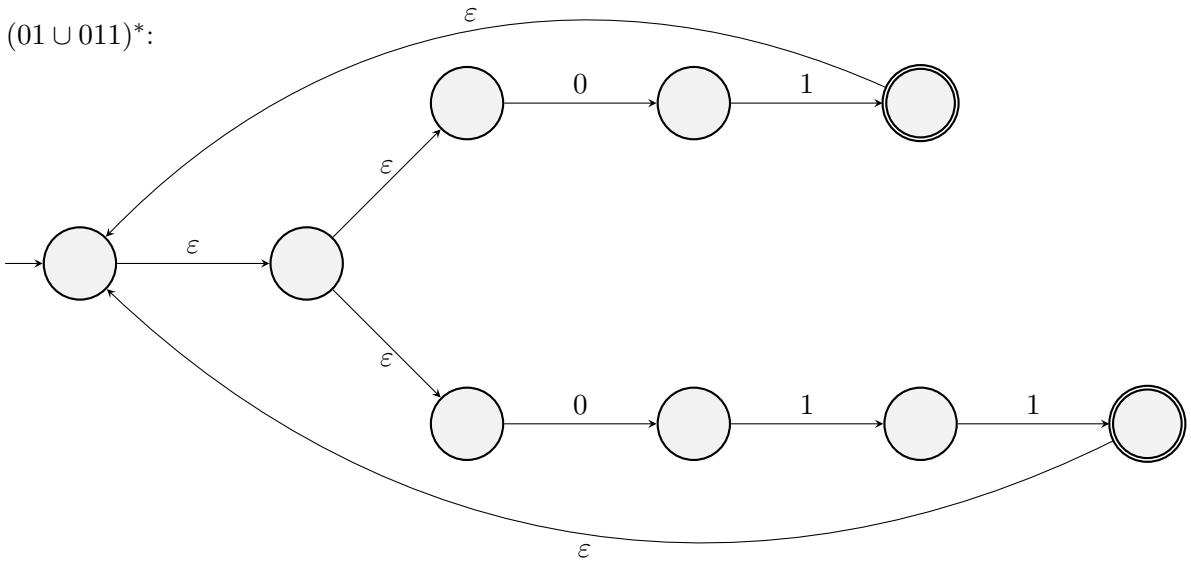
   First, create NFAs for 01 and 011:



$01 \cup 011$:



$(01 \cup 011)^*$:



5. Create an NFA accepting the language A of words ending in an odd number of 1s and an NFA accepting exactly the language B of words ending in 0. Combine these using the technique from the lecture to create an NFA recognizing the concatenation AB.

   Solution. Homework.

6. Convert the NFA in problem 3 into a DFA using the method from our text. Label the states with states describing subsets of the original set of states, omitting states corresponding to unreachable states. Each state in your DFA should have arrows for a and for b.

   Solution. Homework.