Exercises

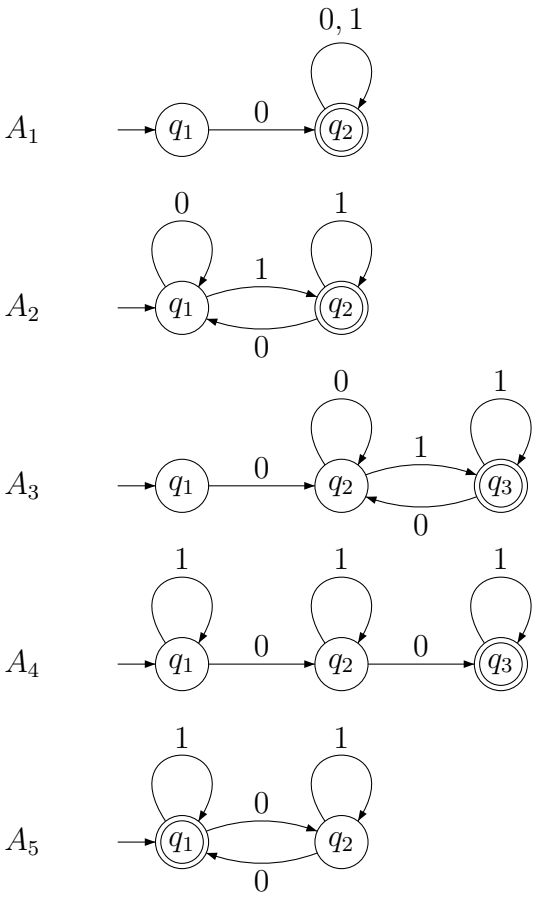
Exercise 1

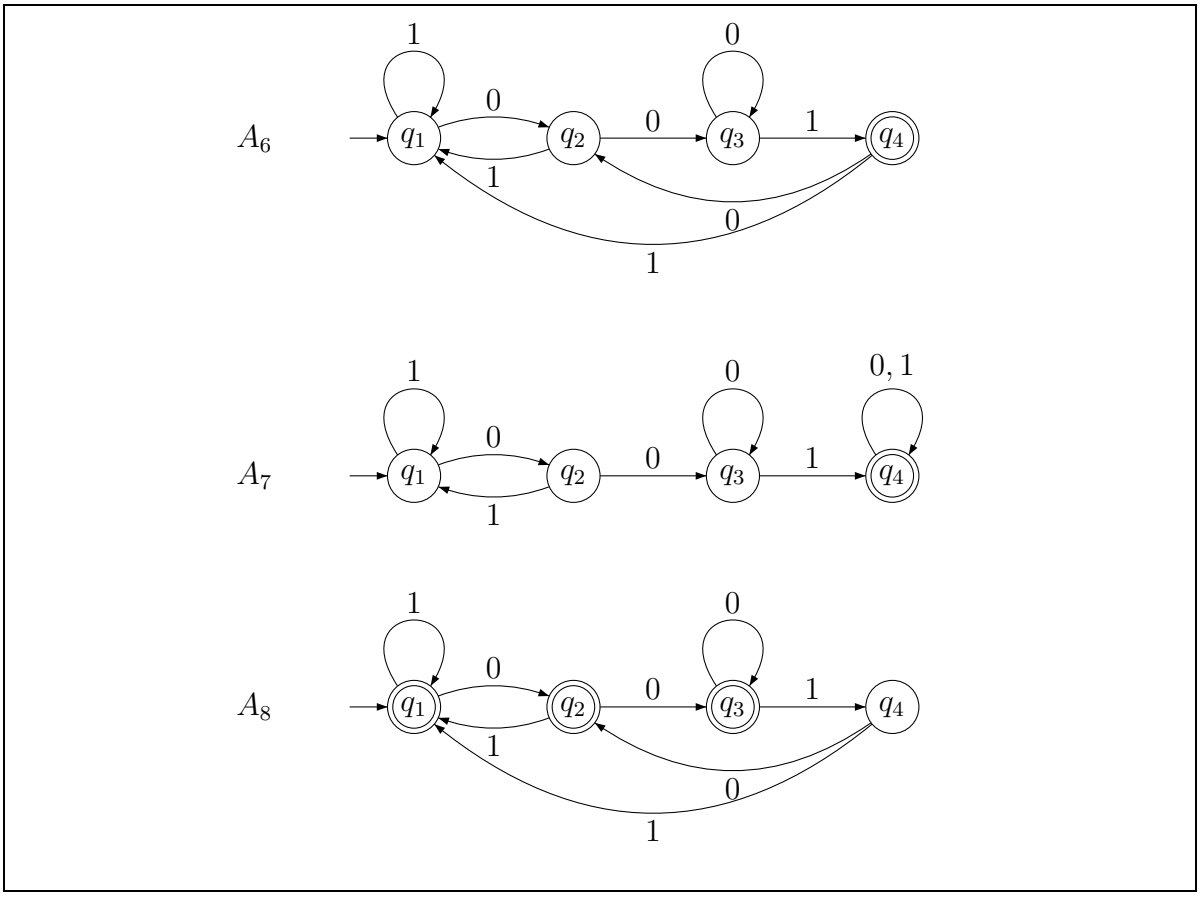
Taking into account the description of the following languages over $\{0,1\}$:

$$
\begin{aligned}
L_1 &= \{0x \ : \ x \in \{0,1\}^*\} \\
L_2 &= \{x1 \ : \ x \in \{0,1\}^*\} \\
L_3 &= \{0x1 \ : \ x \in \{0,1\}^*\} \\
L_4 &= \{x \in \{0,1\}^* \ : \ |x|_0 = 2\} \\
L_5 &= \{x \in \{0,1\}^* \ : \ |x|_0 = \dot{2}\} \\
L_6 &= \{x \in \{0,1\}^* \ : \ 001 \in Suf(x)\} \\
L_7 &= \{x \in \{0,1\}^* \ : \ 001 \in Seg(x)\} \\
L_8 &= \{x \in \{0,1\}^* \ : \ 001 \notin Suf(x)\}
\end{aligned}
$$

Obtain a DFA for each of each of the defined languages.

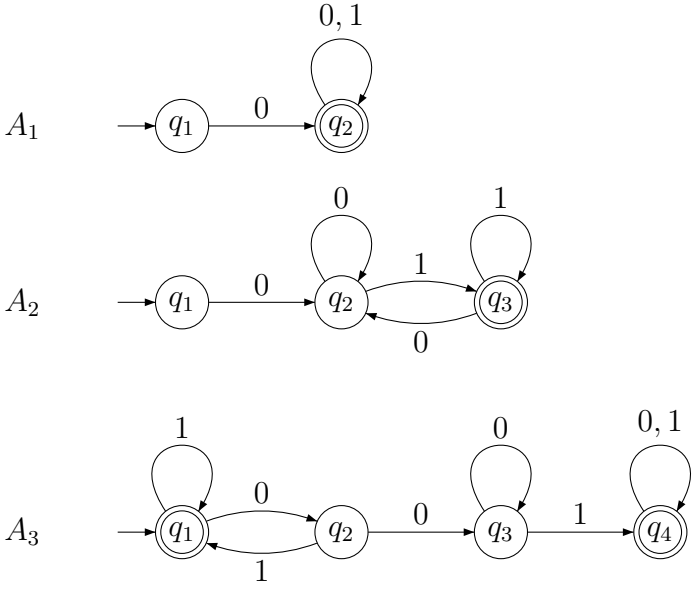
Answer:





Exercise 2

Consider the following automata:



Provide a description of the following right languages:

(a) Taking into account A_1, the language R_{q_2}

Answer:

$R_{q_2} = \{0,1\}^*$

(b) Taking into account the automata A_2, the languages R_{q_2} and R_{q_3}

Answer:

$R_{q_2} = \{x1 \ : \ x \in \{0,1\}^*\}$
$R_{q_3} = \{x1 \ : \ x \in \{0,1\}^*\} \cup \{\lambda\}$

(c) Taking into account the automata A_3, the language R_{q_3}

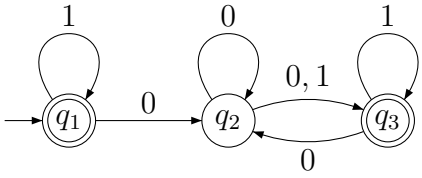
Answer:

$R_{q_3} = \{x \in \{0,1\}^* \ : \ |x|_1 \neq 0\}$

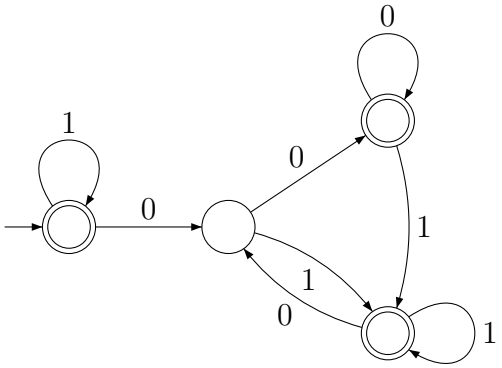
Exercise 3

Obtain a DFA equivalent to the following non-deterministic automata:

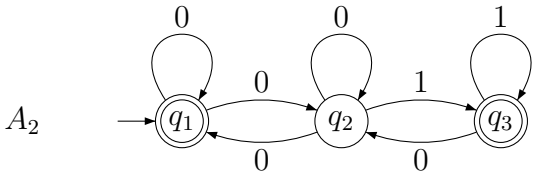
(a)



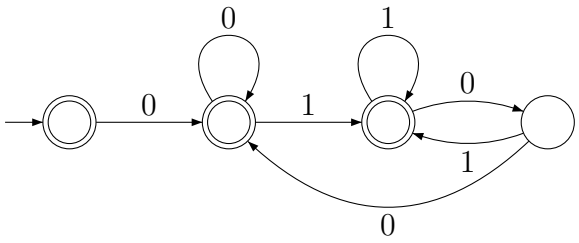
Answer:



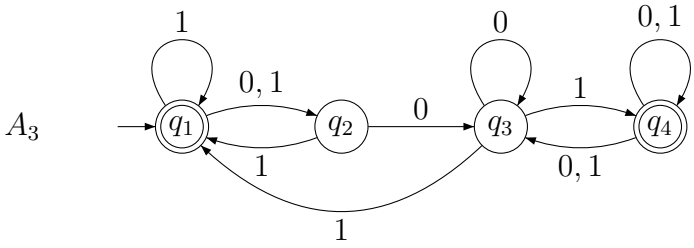
(b)



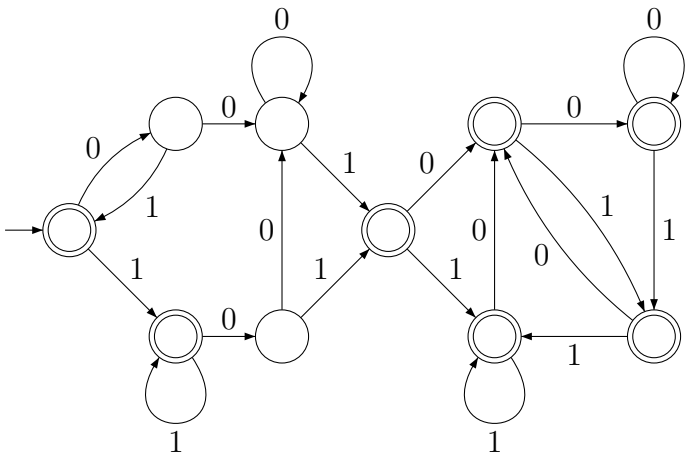
Answer:



(c)



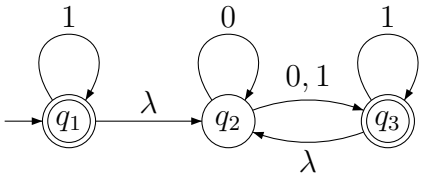
Answer:



Exercise 4

Consider the following λ-FA and compute the λ-closure of each state.

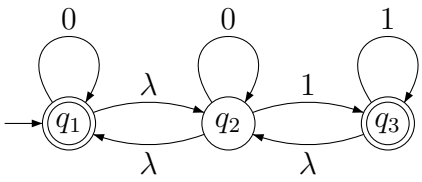
(a)



Answer:

$$\lambda - closure(q_1) = \{q_1, q_2\}$$
$$\lambda - closure(q_2) = \{q_2\}$$
$$\lambda - closure(q_3) = \{q_2, q_3\}$$

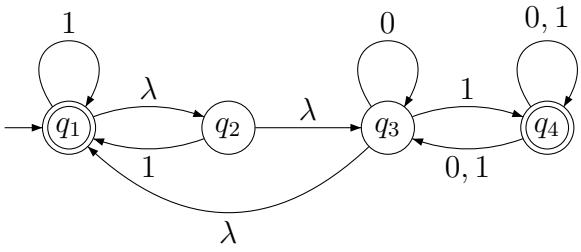
(b)



Answer:

$$\lambda - closure(q_1) = \{q_1, q_2\}$$
$$\lambda - closure(q_2) = \{q_1, q_2\}$$
$$\lambda - closure(q_3) = \{q_1, q_2, q_3\}$$

(c)



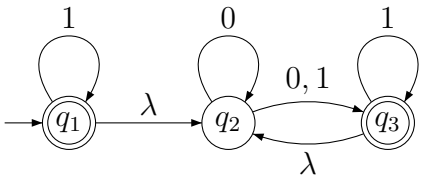
Answer:

$$\lambda - closure(q_1) = \{q_1, q_2, q_3\}$$
$$\lambda - closure(q_2) = \{q_1, q_2, q_3\}$$
$$\lambda - closure(q_3) = \{q_1, q_2, q_3\}$$
$$\lambda - closure(q_4) = \{q_4\}$$

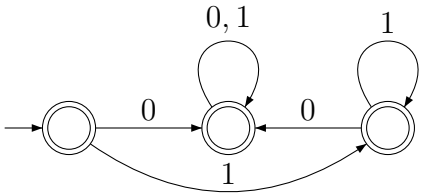
Exercise 5

Obtain a DFA equivalent to each one of the following λ-FA

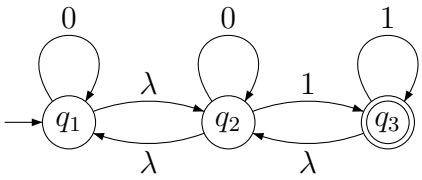
(a)



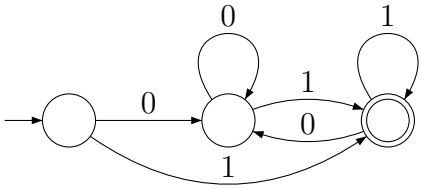
Answer:



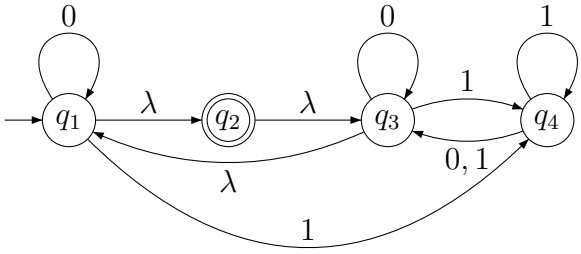
(b)



Answer:



(c)



Answer: