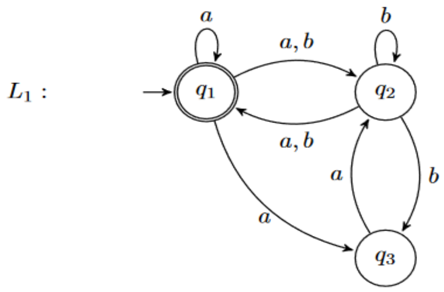
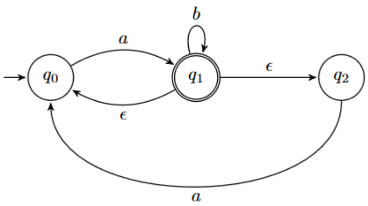
1. Let the Finite Automaton below accept the language L_1 under the alphabet $\Sigma = \{a, b, c\}$. Submit a Deterministic Finite Automaton that accepts the language $\Sigma^\star - L_1$.



2. Consider automaton A below:



3. Someone presented the description below as the function that describes the functioning of the automaton with transition ϵ over strings (function $\hat{\delta}$):

$$
\begin{aligned}
\hat{\delta}(q,\epsilon) &= \{q\} \cup \hat{\delta}(q,\epsilon) \\
\hat{\delta}(q,\sigma\omega) &= \left(\bigcup_{q' \in \delta(q,\epsilon)} \hat{\delta}(q',\sigma\omega)\right) \cup \bigcup_{q' \in \delta(q,\sigma)} \hat{\delta}(q',\omega)
\end{aligned}
$$

(a) According to what you learned about automatons with transition ϵ, automaton A accepts the word aba? Present all possible sequence of state transitions from the word tab in automaton A to from the initial state. Calculate $\hat{\delta}(q_0, \text{tab})$ and check if you agree with the result obtained previously. Finally, argue about the correctness of the description above $\hat{\delta}$.

b) Present a Finite Automaton (deterministic or not) equivalent to A and without transitions ϵ. Justify your answer.

4. Consider the language pairs (expressed by er) in each row in the table below.

$0^*1(01^*0+10^*1)^*$		$(0+101^*01)^*1$
$(0+1)^*00(0+1)^*$		$(1^*00+1^*01(0+1)^*00)(0+1)^*$
$(0+10^*1)^*$		$(0+10^*1)^*(0+10^*1)^*$
$(10^*+1000)^*$		$(10^*+1010)^*$

In each line of the table, in the central field, fill in with ⊊, =, ⊋ and ×, according to the first language is different from the second and subset of it, or; the second language is different from the first and subset thereof, or; the first language is the same as the first, or; the first and second languages it does not have a subset relation to each other, being different. Justify your answer by displaying words that belong to the first and not the second, or vice versa, and in the case of equality, precise shape.