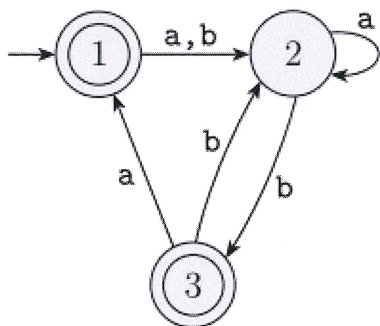


1. Consider the DFA, M_0 , whose state diagram is given below.

- (a) (__ /1 pt) List the sequence of states M_0 goes through on input babb.
- (b) (__ /1 pt) Does M_0 accept the string ε ?
- (c) (__ /2 pts) Formally define the transition function δ of M_0 .

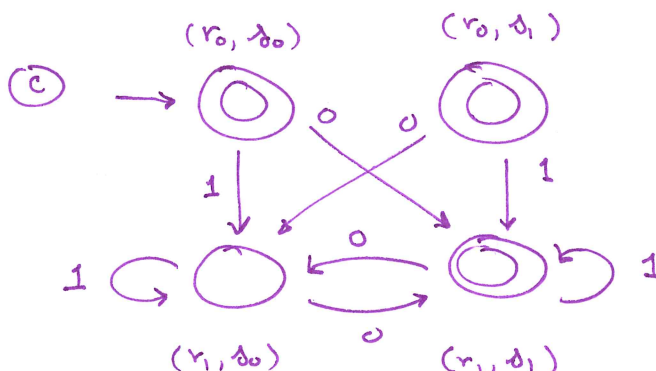
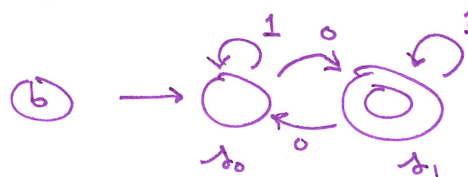
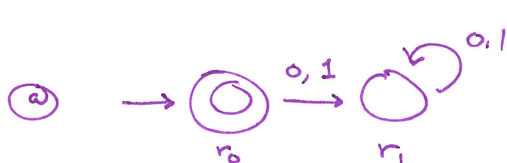


- (a) start
1 2 2 3 2
- (b) yes! The start state is an accept state.
- (c) Let $Q = \{1, 2, 3\}$ and $\Sigma = \{a, b\}$.
 $\delta: Q \times \Sigma \rightarrow Q$ where
- | δ | a | b |
|----------|---|---|
| 1 | 2 | 2 |
| 2 | 2 | 3 |
| 3 | 1 | 2 |

2. Consider the alphabet $\Gamma = \{0, 1\}$ and the following languages.

$$A_1 = \{\varepsilon\} \text{ and } A_2 = \{w \mid w \text{ has exactly an odd number of 0s}\}$$

- (a) (__ /1.5 pts) Give a state diagram of a DFA, M_1 , recognizing A_1 .
- (b) (__ /1.5 pts) Give a state diagram of a DFA, M_2 , recognizing A_2 .
- (c) (__ /3 pts) Combine your state diagrams of M_1 and M_2 to give a state diagram of a DFA, M_3 , which recognizes $A_1 \cup A_2$.



NOTE: State (r_0, s_1) and its outgoing edges can be deleted.