3. Regular languages, Finite Automata

Let $\Sigma = \{a, b\}$.

3.1. 1. Construct a DFA $M_1$ such that

$$L(M) = L_1 = \{w \in \Sigma^* \mid \#_a(w) \text{ is divisible by } 3\}.$$ 

Answer, see figure.

After reading a word, any $b$ doesn’t change the state. Reading an ‘a’ increases modulo 3 the state by 1. Hence $q_i$ indicates that the number of $a$’s mod 3 is $i$. Therefore $q_0$ should be the beginning and final state.

2. Construct an $M_2$ such that

$$L(M) = L_2 = \{w \in \Sigma^* \mid \#_b(w) \text{ is divisible by } 2\}.$$ 

Answer, see figure.

3. Construct a NFA $\lambda M_3$ such that $L(M_3) = L_1 \cup L_2$. Answer, see
4. Construct a DFA $M_4$ such that $L(M_4) = L_1 \cup L_2$. We now have to find a deterministic version of the last NFL$_\lambda$. By the method in the lectures this is