14. Exercises for the Course

‘Automata and Logic’

Exercise 67:
Let $\Sigma = \{a, b\}$ and $A$ the Rabin-automaton

$$A = (\{q_0, q_1, q_2\}, \Sigma, \{q_2\}, \Delta, \{(q_0, q_2), (q_1)\}),$$

where

$$\Delta_a: q_0 \rightarrow \{(q_1, q_1)\} \quad \Delta_b: q_0 \rightarrow \{(q_0, q_0)\}$$

$$q_1 \rightarrow \{(q_1, q_1)\} \quad q_1 \rightarrow \{(q_0, q_0)\}$$

$$q_2 \rightarrow \{(q_0, q_1)\} \quad q_2 \rightarrow \{(q_0, q_1)\}$$

Use the method from the proof of Proposition 7.12 to decide whether $L_\omega(A) = \emptyset$ or not.

Exercise 68:
Let $\Sigma = \{0, 1\}$ and

$$L = \{t \in T_\Sigma^* \mid \text{for every path } p, \text{ if } p \text{ contains a } 0, \text{ then } p \text{ contains only finitely many } 1\text{s}\}.$$

Give an S2S formula $\varphi$ such that $L_\omega(\varphi) = L$.

Exercise 69:
For the automaton $A$ from Exercise 67, give an S2S formula $\varphi$ with $L_\omega(A) = L_\omega(\varphi)$. 