

Homework #1

(Due: Sep 23)

Task 1. [100 Points] Construct DFAs

Construct a DFA to accept each of the following regular languages. Assume that $\Sigma = \{a, b\}$ unless specified otherwise.

- (a) [5 Points] $L = \{w \mid |w| \leq 3\}$
- (b) [5 Points] $L = \{w \mid |w| \geq 3\}$
- (c) [5 Points] $L = \{w \mid n_a(w) = 2\}$
- (d) [5 Points] $L = \{w \mid n_a(w) \leq 2\}$
- (e) [5 Points] $L = \{w \mid n_a(w) \geq 2\}$
- (f) [5 Points] $L = \{w \mid n_a(w) \bmod 3 = 1\}$
- (g) [5 Points] $L = \{w \mid \text{binary number } w \bmod 3 = 1\}$ for $\Sigma = \{0, 1\}$
- (h) [5 Points] $L = \{w \mid w \text{ starts with } ab\}$
- (i) [5 Points] $L = \{w \mid w \text{ contains } ab\}$
- (j) [5 Points] $L = \{w \mid w \text{ ends with } ab\}$
- (k) [5 Points] $L = \{w \mid w \text{ starts with } a \text{ and ends with } b\}$
- (l) [5 Points] $L = \{w \mid w \text{ starts and ends with different symbols}\}$ for $\Sigma = \{a, b, c\}$
- (m) [5 Points] $L = \{w \mid w \text{ starts and ends with the same symbol}\}$ for $\Sigma = \{a, b, c\}$
- (n) [5 Points] $L = \{w \mid \text{every } a \text{ in } w \text{ is followed by a } b\}$
- (o) [5 Points] $L = \{w \mid \text{no } a \text{ in } w \text{ is followed by a } b\}$
- (p) [5 Points] $L = \{w \mid w \text{ contains } (a(a \cup b)^*a)^+\}$
- (q) [5 Points] $L = \{w \mid n_a(w) \bmod 5 = 3 \text{ and } n_b(w) \bmod 2 = 1\}$
- (r) [5 Points] $L = \{w \mid n_a(w) \bmod 3 = 2 \text{ and } w \text{ contains } ab\}$
- (s) [5 Points] $L = \{w \mid n_a(w) \bmod 3 = 1 \text{ or } w \text{ contains } ba\}$
- (t) [5 Points] $L = \{w \mid \text{binary number } w \text{ is divisible by } 7\}$ for $\Sigma = \{0, 1\}$