

Automata and formal languages

Exercise

Answer the following questions and submit your report by next week.

1. Let $\Sigma = \{a, b\}$, define $n_a, n_b : \Sigma^* \rightarrow N$ (where N is the set of natural numbers) such that $n_a(w)$ is the number of a 's in w and $n_b(w)$ is the number of b 's in w . Show that the following languages are not regular

(a) $L_1 = \{w : n_a(w) = n_b(w)\}$

(b) $L_2 = \{w : n_a(w) \neq n_b(w)\}$

2. Show that the language $\{0^n 10^n : n \geq 1\}$ is not a regular language.
3. Construct a finite automaton that accepts the language generated by the grammar:

$$S \longrightarrow aaS|aA$$

$$A \longrightarrow abS|b$$

4. Construct a right-linear grammar that accept the language:

$L = \{w : w \text{ has both an even number of } 0\text{'s and an even number of } 1\text{'s}\}$