Introduction to Computation and Complexity
Exercise Sheet 2

Adrien Pommellet, EPITA

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Exercise 1

Design a Turing machine M recognizing the language $\{ww^R \mid w \in \Sigma^*\}$, where w^R is the reverse of the word w.

Exercise 2

Design a Turing machine M recognizing the language $\{a^n b^n c^n \mid n \geq 1\}$.

Exercise 3

Let L be a language such that $\overline{L}$ is not RE. Prove that:

$$L' = \{0w \mid w \in L\} \cup \{1w \mid w \in \overline{L}\}$$

is not RE.

Exercise 4

Let $L_1, \ldots, L_n$ be a collection of RE languages that is also a *partition* of Σ^*, i.e. $\forall i \neq j, L_i \cap L_j = \emptyset$ and $L_1 \cup \ldots \cup L_n = \Sigma^*$. Prove that for $i = 1, \ldots n$, the language L_i is recursive.