Exercise meeting 6

Exercise 6.1

Consider a Turing machine with $E = \{q_E\}$, which encodes the function $f(\texttt{a}^n) = (\texttt{ab})^n$ for $n \in \mathbb{N}_0$. Will the Turing machine stop on the following input? If so, what does the final configuration look like?

  (i) `a`

 (ii) `aa`

(iii) ε

 (iv) `ab`

Exercise 6.2

  (a) Specify a Turing machine which removes a prefix of zeros from an input over $\Sigma = \{0, 1\}$. Let the result be 0 if the input consists of zeros only or is ε.

  (b) Specify a Turing machine which accepts an input over $\Sigma = \{0, 1, \texttt{\#}\}$ if and only if the input encodes two positive binary numbers, separated by a single `#`-sign.

Exercise 6.3

Specify the transition diagram of a Turing machine which computes the *predecessor function* $pred_2 : \mathbb{N}_0 \to \mathbb{N}_0$ over the natural numbers:

$$pred_2(n) = \begin{cases} n - 1 & \text{if } n \geq 1 \\ \text{undefined} & \text{if } n = 0 \end{cases}$$