

# Automata Exercises

Tasks for 11.12.2015

**Task 1** Construct a TM that takes an input word  $w$  (in any alphabet), shifts it for one position to the right on the tape, and writes a  $*$  at the leftmost cell of the tape. Upon termination, the head of the machine should point at the leftmost cell of the tape.

**Task 2** Construct a TM for computing the function  $f(n) = 2n$  for  $n \in \mathbb{N}$  in unary notation where  $n$  is represented by  $n + 1$   $|$ 's.

**Task 3** Construct a TM that computes the function  $f(n, m) = n + m$  for  $n, m \in \mathbb{N}$  where the input is given in unary notation, i.e., as a word  $|^n \# |^m$  on the tape.

**Task 4** Construct a TM for deciding the language

$$L = \{a^i b^j c^k \mid i + j = k\}.$$