Theory of Computable Functions
Problem Set 0
13 September 2017

The task of this Problem Set is to demonstrate that a number of functions can be computed by Turing Machines or that there are Turing machines that perform certain actions.

PROBLEM 0.
Devise a Turing machine that moves one square to the right and stops. Call this Turing machine T_{right}. There is also T_{left}, but don't worry about it.

PROBLEM 1.
Devise a Turing machine T_0 that writes a 0 and stops. Don't worry about T_1.

PROBLEM 2.
Devise a Turing machine $T_{\ell\text{seek}0}$ that finds the first 0 to the left and stops. Don't worry about $T_{r\text{seek}0}$.

PROBLEM 3.
Devise a Turing machine $T_{\ell\text{seek}1}$ that finds the first 1 to the left, if there is one, and stops, but never stops if there is none.

PROBLEM 4.
Devise a Turing machine that performs subtraction. This machine should should halt when given n and m with the result $n - m$ provided $m \leq n$ and otherwise the machine doesn't halt.

PROBLEM 5.
Devise Turing machines U_i^n to compute projection functions. Here $U_i^n(a_0, a_1, \ldots, a_{n-1}) = a_i$.