

Exercise for the lecture
Computational Complexity
Winter 2014/15
Sheet 1

EXERCISE 1:

Consider the language $\text{INDEX} \subseteq \{0, 1, \$, \#\}^*$:

$$\text{INDEX} := \left\{ \$u_1\#u_2\#\cdots\#u_m\$u_{i_1}u_{i_2}\cdots u_{i_k}\$ \mid \begin{array}{l} m \in \mathbb{N}, \forall i \in \mathbb{N} : u_i \in \{0, 1\}^*, \\ \forall j \in \{1, \dots, k\} : i_j \in \{1, \dots, m\} \end{array} \right\}$$

1. Prove that INDEX is computable by (informally) constructing a deterministic TM.
2. What is the time behavior of your deterministic TM?
3. Find a NTM which can compute INDEX in time $\mathcal{O}(n^2)$.
4. Discuss the relationship of INDEX to the Post correspondence problem.