NMMB415 Automata and Computational Complexity Fall 2024/2025

Homework Assignment 4 - NP and space complexity

Deadline: 16.12.2024, 9:00 in Moodle.

Problem 1. Let $UNARYSUBSETSUM = \{\langle\{x_1, x_2, \ldots, x_n\}, t\rangle, x_1, \ldots, x_n, t \in \{1\}^*$, there is a set $S \subseteq \{x_1, \ldots, x_n\}, \sum_{x \in S} x = t\}$ be the unary version $SUBSETSUM$, where the number of ones determines the value of a number. E.g.: $1 = 1, 11 = 2, 111 = 3$, etc. Show that $UNARYSUBSETSUM$ is solvable in polynomial time.

Problem 2. Undirected graph is bipartite if we can partition its vertices in two parts so that edges are only between vertices from different parts. Show that a graph is not bipartite if and only if it contains a cycle (closed path) of odd length. Show that deciding bipartiteness of G is in NL.

Problem 3. Show that the language $DYCK = \{w \in \{(,)\}^*$, w is well parenthesised expression$\}$ is in L. For example: (()()), (), ((())) are in $DYCK$, but)(, (are not.