Technische Universität München
Fakultät für Informatik
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Spring Semester 2013
Problem Set 7
June 11, 2013

Complexity Theory

Due date: June 18, 2013 **before** *class!*

Problem 1 (10 Points)

Describe a decidable language in $\mathcal{P}_{/poly}$ that is not in $\mathcal{P}$.

Problem 2 (10 Points)

A language $L \subseteq \{0,1\}^*$ is *sparse* if there is a polynomial p such that $|L \cap \{0,1\}^n| \leq p(n)$ for every $n \in \mathbb{N}$.
Show that every sparse language is in $\mathcal{P}_{/poly}$.

Problem 3 (10 Points)

The language Connected from Problem Set 1 is in $\mathcal{P}$, hence it can be computed with a logspace-uniform circuit family. Describe the construction of such a circuit, when the input is given by the adjacency matrix A of a graph G, i.e. the input variables are the n^2 entries of A.

Problem 4 (10 Points)

Describe a construction of a logspace-uniform circuit family for deciding the language Bipartite from Problem Set 1. The input is again given by the graph's adjacency matrix A.
Hint: Use an approach similar to that of the transitive closure to compute paths of odd and even length, respectively.