

Hans U. Simon
Francesco Aldà

Bochum, January 12th 2017
Deadline on January 19th 2017

Homework for
Komplexitätstheorie
A. Y. 16/17
Assignment 11

Exercise 11.1

Show that the language GM related to the game “Go-moku” belongs to PSpace. Please refer to the end of Section 17.3 of the lecture notes for a definition of Go-moku and GM.

Exercise 11.2

Let UNIQUE-SAT (USAT) be the following decision problem. Given a CNF-formula F , is there a unique satisfying assignment for F ?

Show that the corresponding language $L_{USAT} \in \Delta_2$.

Exercise 11.3

In the lecture, we discussed the closure property

$$L \in \mathcal{C} \Rightarrow L_\epsilon \in \mathcal{C}.$$

Show that the complexity classes Σ_k, Π_k actually have this property for each choice of $k \geq 0$.

Exercise 11.4

Find a class \mathcal{C} of languages for which the statement $\mathcal{C} \subseteq (\exists)_{pol}[\mathcal{C}]$ is false, and argue why.