University of Konstanz
Department of Computer & Information Science
Prof. Dr. Sven Kosub / Michael Aichem

Complexity Theory
Winter 2016

Assignment 1

Issue date: 26 Oct 2016   **Due date:** 02 Nov 2016

Exercise 1.

Show that $\log^k n \leq_{\text{a.e.}} \varepsilon \cdot n$ holds for all $k \in \mathbb{N}_+$, $n \in \mathbb{N}$, and $\varepsilon > 0$.

Hint: Use induction on k and use, in the inductive step, induction on n.

Exercise 2.

Define $S =_{\text{def}} \{\ ww^R \mid w \in \{0,1\}^*\ \}$. Show that the following holds for all $\varepsilon > 0$:

  (a) $S \in 2\text{-T-DTIME}\big((1,5+\varepsilon) \cdot n\big)$

  (b) $S \in 2\text{-T-DSPACE}\big(\varepsilon \cdot \log n\big)$

Exercise 3.

Define $C =_{\text{def}} \{\ 0^n 1^n \mid n \in \mathbb{N}\ \}$. Show that the following holds for all $\varepsilon > 0$:

  (a) $C \in \text{T-DTIME}\big(\varepsilon \cdot n \log n\big)$

  (b) $C \in 1\text{-T-DSPACE}\big(\varepsilon \cdot \log n\big)$