ETH *zürich*
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Theoretische Informatik

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Exercises – Sheet 13

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Exercise 35

Using the pumping lemma for context-free languages, prove that the following languages are not context-free.

(a) $L_1 = \{a^n b^{n^3} \mid n \geq 1\}$,

(b) $L_2 = \{ucv \in \{a, b, c\}^* \mid u, v \in \{a, b\}^*$ and u is a prefix of $v\}$.

10 Punkte

Exercise 36

Let $L_1, L_2 \subseteq \{a, b\}^*$ be a context-free and a regular language, respectively. Prove that $L_1 \cap L_2$ is context-free. **10 Punkte**

Exercise 37

Construct a nondeterministic pushdown automaton that accepts the following language

$$L = \{w \in \{a, b\}^* \mid w = uv \text{ and } |u| = k \text{ and } v = b^{3k} \text{ for some } k \in \mathbb{N}\}.$$

Provide a detailed justification of your construction's correctness. **10 Punkte**

Remark: Solutions for this exercise sheet cannot be submitted and graded due to time constraints. However, questions regarding the exemplary solutions can be asked during the lecture on December 18 or in your exercise class.