

## Exercises – Sheet 11

Zürich, December 10, 2021

### Exercise 30

Prove that the following languages are not context-free.

- (a)  $L_1 = \{u\#v\#w \mid u, v, w \in \{0, 1\}^+ \text{ and } \text{Number}(u) + \text{Number}(v) = \text{Number}(w)\}$ .
- (b)  $L_2 = \{ucv \in \{a, b, c\}^* \mid u, v \in \{a, b\}^* \text{ and } u \text{ is a suffix of } v\}$ .

**10 points**

### Exercise 31

Let  $L_1, L_2 \subseteq \{a, b\}^*$ , where  $L_1$  is a context-free language and  $L_2$  is a regular language.

Prove that  $L_1 \cap L_2$  is context-free.

**10 points**

### Exercise 32

A two-stack pushdown automaton is an extension of a pushdown automaton that has two stacks. Given a Turing machine  $M$ , informally justify why there exists a two-stack pushdown automaton  $A$  such that  $L(A) = L(M)$ .

**10 points**

**Submission:** On Friday, December 17, 2021, by 11:15 at the latest, as a legible PDF via e-mail directly to the respective teaching assistant.