

Formal Languages and Automata Theory

Homework 7 (CFL-2), Due date 5.12.2017

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Consider the following grammars:

- $G_1 = \langle \{S, A\}, \{a, b, c, d, e, f\}, \{S \rightarrow AdA \mid AeA \mid AfA, A \rightarrow S \mid a \mid b \mid c\}, S \rangle$
- $G_2 = \langle \{S, A, R, L\}, \{(\cdot)\}, \{S \rightarrow AR \mid SS \mid \epsilon, A \rightarrow LS, R \rightarrow \cdot\}, L \rightarrow \{\cdot\}, S \rangle$

Exercise 1 (8 points) Provide derivations (identify whether they are rightmost, leftmost, or neither) and derivation trees for the following strings:

- $aecfa$ (using G_1)
- $bfdcea$ (using G_1)
- $()()$ (using G_2)
- $((()))$ (using G_2)

Exercise 2 (2 points) Describe what kind of strings are generated by G_1 and G_2 .

Exercise 3 (4 points) Are G_1 and G_2 ambiguous or not? Motivate your answer.

Exercise 4 (2 points) Are G_1 and G_2 in Chomsky Normal Form or not? Motivate your answer.