

Homework #6  
CS322/KAIST 2011 FALL  
Choe, Kwang-Moo  
Due date: 11/10, 14:30  
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**Exercise 1 (5pt)**

Let  $G$  be the grammar

$$S \rightarrow aB \mid bA$$

$$A \rightarrow a \mid aS \mid bAA$$

$$B \rightarrow b \mid bS \mid aBB$$

For the string  $aaabbabbba$  find a

- (a) (1 pt) leftmost derivation
- (b) (1 pt) rightmost derivation
- (c) (1 pt) parse tree
- (d) (2 pt) describe in words the language generated by  $G$

**Exercise 2 (10pt)** The following grammar generates prefix expressions with operands  $x$  and  $y$  and binary operators  $+$ ,  $-$  and  $*$  :

$$E \rightarrow +EE \mid *EE \mid -EE \mid x \mid y$$

- (a) (5 pt) find leftmost and rightmost derivations, and a derivation tree for the string  $+*-xyxy$ .
- (b) (5 pt) prove that this grammar is unambiguous.

**Exercise 3 (5pt)** Convert following CFG into equivalent pushdown automaton.

$$S \rightarrow S + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (S) \mid a$$