Assignment2

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Problem 1

Consider the context-free grammar:

$$S \to SS+ \mid SS* \mid a$$

and the string:

$$aa+a*$$

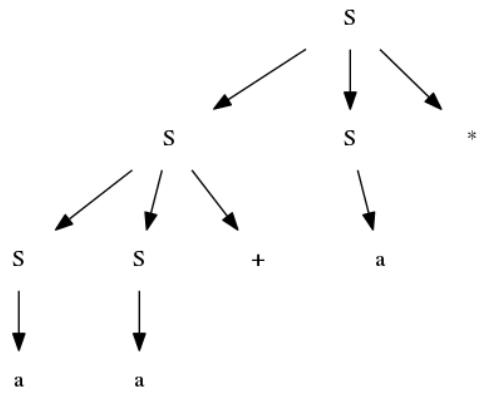
Leftmost derivation for the string

$$S \underset{lm}{\Longrightarrow} SS* \underset{lm}{\Longrightarrow} SS+S* \underset{lm}{\Longrightarrow} aS+S* \underset{lm}{\Longrightarrow} aa+S* \underset{lm}{\Longrightarrow} aa+a*$$

Rightmost derivation for the string

$$S \underset{rm}{\Longrightarrow} SS* \underset{rm}{\Longrightarrow} Sa* \underset{rm}{\Longrightarrow} SS+a* \underset{rm}{\Longrightarrow} Sa+a* \underset{rm}{\Longrightarrow} aa+a*$$

Parse tree for the string



Problem 2

A

This grammar is already left factored.

B

No.

C

$$
\begin{aligned}
rexpr &\rightarrow rtermrexpr' \\
rexpr' &\rightarrow +rtermrexpr'|\epsilon \\
rterm &\rightarrow rfactorrterm' \\
rterm' &\rightarrow rfactorrterm'|\epsilon \\
rfactor &\rightarrow rprimary * rfactor' \\
rfactor' &\rightarrow *rfactor'|\epsilon \\
rprimary &\rightarrow a|b
\end{aligned}
$$

D

Yes.

Problem 3

Compute FIRST and FOLLOW for the grammar:

A

$$S \rightarrow 0S1|01withstring000111$$

FIRST(S) = {0}
FOLLOW(S) = {1, $}

B

$$S \rightarrow +SS|*SS|awithstring+*aaa$$

FIRST(S) = {+, *, a}
FOLLOW(S) = {+, *, a, $}