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CSEN 1003 Compiler, Spring Term 2020
Practice Assignment 4

Discussion: 23.02.20 - 26.02.20

Exercise 4-1
Eliminating Left Recursion

Eliminate left-recursion from each of the following grammars:

a) $S \rightarrow S\mathtt{a} \mid \mathtt{b}$

b) $S \rightarrow S\mathtt{ab} \mid \mathtt{cd}$

c) $S \rightarrow S \cup S \mid S\,S \mid S* \mid (S) \mid \mathtt{a}$

d)
$$
\begin{aligned}
rexpr &\rightarrow rexpr \cup rterm \mid rterm \\
rterm &\rightarrow rterm\,rfactor \mid rfactor \\
rfactor &\rightarrow rfactor* \mid rprimary \\
rprimary &\rightarrow \mathbf{a} \mid \mathbf{b}
\end{aligned}
$$

e)
$$
\begin{aligned}
A &\rightarrow \mathtt{0} \mid T\mathtt{1} \\
T &\rightarrow \mathtt{1} \mid A\mathtt{0}
\end{aligned}
$$

f)
$$
\begin{aligned}
A &\rightarrow BC \\
B &\rightarrow Bb \mid \varepsilon \\
C &\rightarrow AC \mid \mathtt{a}
\end{aligned}
$$

Exercise 4-2
Left Factoring

Left-factor each of the following grammars:

a) $S \rightarrow \mathtt{0}S\mathtt{1} \mid \mathtt{01}$

b) $S \rightarrow \mathtt{abx} \mid \mathtt{aby} \mid \mathtt{acx} \mid \mathtt{acy}$

Exercise 4-3

Consider the following CFG:

$$
\begin{aligned}
S &\rightarrow (L) \mid \mathtt{a} \\
L &\rightarrow L\mathtt{,}S \mid S
\end{aligned}
$$

Eliminate the left recursion.

Exercise 4-4

Consider the following CFG:

$S \rightarrow SS\texttt{+} \mid SS\texttt{*} \mid \texttt{a}$

Left factor the grammar and eliminate left recursion.