

Context-Free Grammars: Problemsolving

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1 PROBLEM 1

Show that the following languages are context-free, by giving context-free grammars for them.

1.1 $L = \{', 'abb', 'aabbbb', 'aaabbbbb', \dots\}$.
THAT IS, $L = \{a^n b^{2n}, \text{ WHERE } n \geq 0\}$.

1.2 THE LANGUAGE L THAT CONSISTS OF ALL STRINGS OF *balanced parentheses*: FOR EXAMPLE, $((())())$ IS IN L , BUT $()()()$ IS NOT IN L .

1.3 $L = \{x \in \{a, b\}^*, \text{ WHERE } x \text{ CONTAINS AN EQUAL NUMBER OF } a\text{'S AND } b\text{'S}\}$

1.4 $L = \{x \in \{a, b\}^*, \text{ WHERE } x \text{ CONTAINS MORE } a\text{'S THAN } b\text{'S}\}$

2 PROBLEM 2

Show that context-free languages are “closed under union”: that is, if A and B are CFLs, then $A \cup B$ is a CFL also.