

Homework 5
CS 321
Due Date: 11/13/09, 2 PM

Note: The homeworks should be your own work. You can discuss the homeworks orally with your peers, however. You should not use any web sources for this assignment. Please see the TA and the instructor during the office hours to get more help.

1. Find context-free grammars for the following languages (with $n \geq 0, m \geq 0, k \geq 0$).
 - (a) [5.1 Problem 7e] $L = \{w \in \{a, b\}^* : n_a(w) \neq n_b(w)\}$
 - (b) [5.1 Problem 8d] $L = \{a^n b^m c^k : n + 2m = k\}$.
 - (c) [5.1 Problem 8g] $L = \{a^n b^m c^k : k \neq n + m\}$.
2. [5.1 Problem 19] Show a derivation tree for the string $aabbbb$ with the grammar:
 $S \rightarrow AB|\lambda$,
 $A \rightarrow aB$,
 $B \rightarrow Sb$.
(Don't worry about the verbal description)
3. [5.1 Problem 24] Find a context-free grammar that can generate all the production rules for context-free grammars with $T = \{a, b\}$ and $V = \{A, B, C\}$.
4. [5.2 Problem 3] Find an s-grammar for $L = a^n b^{n+1} : n \geq 2$.
5. [5.2 Problem 7] Construct an unambiguous grammar equivalent to the grammar:
 $S \rightarrow AB|aaB, A \rightarrow a|Aa, B \rightarrow b$.
6. [5.2 Problem 12] Show that the language $L = \{ww^R : w \in \{a, b\}^*\}$ is not inherently ambiguous.
Note: Formal proof not required, but give a convincing argument.
7. [5.2 Problem 13] Show that the following grammar is ambiguous.
 $S \rightarrow aSbS|bSaS|\lambda$.