CS 280: Homework 5

Date of Handout: 27 Oct 99
Due Date: 1 Nov 99 in class
Due date is the MONDAY before the midterm.

Problem 1: For each language L below give a context free grammar which generates L. When a string s is specified, give a parse tree for s and a leftmost derivation of s corresponding to that parse tree. In each case, the alphabet can be inferred from the context.

(a) *(6 points)* $L = \{s \mid s = s^R\}$, i.e., the set of all strings which are identical to their reversals. Such strings are called palindromes. Take $s = aabbaa$.

(b) *(6 points)* $L = \{a^i b^j c^k \mid i = j \text{ or } j = k, \text{ and } i, j, k \geq 0\}$. Take $s = a^2 b^2 c^2$.

(c) *(6 points)* $L =$ strings of as and bs which are NOT palindromes.

(d) *(6 points)* $L =$ strings of opening parentheses (s and closing parentheses)s whose (s can be correctly matched with)s. Take $s = (())()$.

(e) *(6 points)* $L = \{a^{2n} b^k c^{3n} \mid n \geq 0, k \geq 0\}$.

Problem 2: *(10 points)* Write a CFG which generates the set of all strings of as and bs which have exactly twice as many as as bs. (Hint: Take the approach explained in class. Assign a weight of $1/2$ to every a and a weight of -1 to every b. Derive a recursion between strings of total weight 0, $\pm\frac{1}{2}$, ± 1)