CS311 Exercise #6 (revised)

Due by class time, Thursday, Nov. 7, 2013 , Submit via D2L

This worksheet is meant to explore the ideas behind the CFL-pumping lemma. We will not use the lemma to prove anything in this worksheet. First consider the conditions that the lemma sets out: If L is CF, than there is a pumping length, p, such that for every string s in L, if $|s| \geq p$, then there exist string u, v, x, y, and z, such that

0. s = uvxyz
1. $uv^ixy^iz \in L$ for all I
2. $|vy| > 0$
3. $|vxy| <= p$

For each grammar below (where S is the start symbol) do all 6 of the following:

1. Find a string s in L that is "pumpable", or argue that no such string exists (if no such string exists you do not need to do steps 2 through 5; please still do step 6)
2. Write the string as uvxyz. Identify each of the substrings u,v,x,y, and z or s
3. Draw a parse tree for s.
4. Draw a parse tree for uv^0xy^0z
5. Draw a parse tree for uv^2xy^2z
6. Find the smallest constant, p (i.e. 4, 7, 24, you decide) such that for every string of length p or greater, the grammar has a pump.

Grammar 1, over the alphabet {a,b,c}

S -> a T X T c

T -> a

T -> b

X -> b c

Grammar 2, over the alphabet {0,1}

S -> X S

S -> 0

X -> 1

Grammar 3, over the alphabet {a,b,c,d}

S -> S a

S -> X

X -> b c

X -> d