CS581 Worksheet #5

Due by midnight, Thursday, May 2, 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 every string w in L can be written as $xu^iyv^iz \in L$

1. $uv \neq \varepsilon$ ($|uv| > 0$, which means that at least one of u or v is not empty)
2. And for every $i \geq 0$ $xu^iyv^iz \in L$

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

1. Find a string w in L. Write it down.
2. Write the string as xuyvz. Identify each of the substrings x,u,y,v,z of w
3. Draw a parse tree for w.
4. Draw a parse tree for xu^0yv^0z
5. Draw a parse tree for xu^2yv^2z
6. Find the smallest constant, N (i.e. 4, 7, 24, you decide) such that for every string longer than N, 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 {M,N,P,Q}

S -> S M

S -> X

X -> N P

X -> Q