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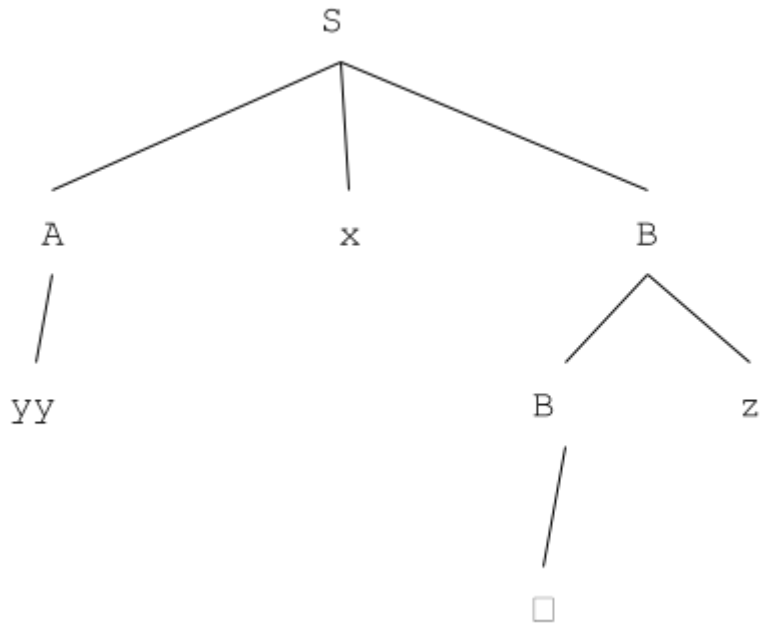
Worksheet #5
Context-Free Grammars

1.Consider the following CFG:

S → AxB
A → yy| yyy | AA
B → ε | Bz

Lower-case letters are terminals and upper-case letters are variables. S is the start variable. Write down five strings in the language described by this grammar. For one of your five strings, show the full parse tree.

1. yyxz (below)
2. yyyyyxzzzzzz
3. yyyxzz
4. yyx
5. yyyyxzzz



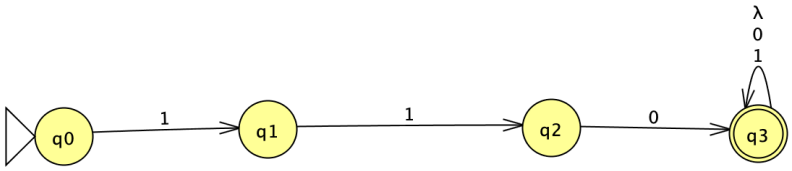
2. Given the language described by the grammar in Question #1, determine which of the following strings are in the language:

E - no
X - no
Yyx - yes
Yyyyyyyxz - no
Xz - no
Yyxxzz - no
Yxz - no
Zzyy - no
Yyyyyx - yes
Yzyz - no
Yzzzz - no
Yx - no
Yzxyz - no
Xxzz - no

3. Which CFGs can be converted into Chomsky Normal Form? Why is CNF useful?

As a rule, all CFGs can be converted to Chomsky Normal Form. CNF is useful because it allows you to easily know the number of steps that are required to reach a given string of length n. This is found using 2n-1.

4. Given a binary alphabet, suppose you have a regular language, L = {w : w begins with the prefix 110}. First build a DFA that accepts L. Then using your DFA as a guide, construct a CFG with language, L.



S → 110A

A → ε | 1A | 0A