

Ling. 610 Fall 2010
Problem Set #1 22 points

Due Tues. 9/14

1. 4 points

Present a finite-state grammar, in graphic form, for each of the following languages.

a. That man laughed
That man and that man laughed
That man and that man and that man laughed
etc.

b. Mary saw an old cat
Mary saw an old old cat
Mary saw an old old old cat
etc.

2. 4 points

- Discuss a phenomenon demonstrating the infinitude of human languages.
- Discuss a phenomenon demonstrating that sentences in human languages have structure.

3. 3 points

Given the following context-free PS grammar, give a derivation for each of the following sentences: abc , $aaabc$, $aabbbbbc$

$S \rightarrow ABC$ $A \rightarrow Aa$ $A \rightarrow a$ $B \rightarrow Bb$ $B \rightarrow b$ $C \rightarrow c$

4. 5 points

Given the following PS grammar, provide the information requested in A-C.

$S \rightarrow AB$ $A \rightarrow aA$ $B \rightarrow b$ $A \rightarrow a$

- Provide all of the equivalent derivations for the sentence aab .
- Give the (set theoretic) phrase marker for the sentence aab .
- Give the reduced phrase marker for the sentence aab (that is, the subset of the phrase marker consisting of the terminal string and the monostrings).

[Remember, to get from one line of a derivation to the next, exactly one rule applies once. Also, recall that two derivations are equivalent if they differ only in the order of application of rules.]

5. 6 points

Consider the following languages and provide the information requested in A and B.

a. $a^n b f c^n$ ($abfc$, $aabfcc$, $aaabfccc$, etc.)

where n is greater than 0 ($n > 0$)

b. $b^n a^{n-1}$ (bba , $bbbaa$, etc.) $n > 1$

- Write a context-free (Σ, F) grammar for each of these languages. Make the grammars as simple as possible. **(Be very careful to avoid 'overgeneration', i.e., generating sentences that are not in the language.)**
- Give derivations for 2 sentences from language a., and 2 from language b.