Ling. 610  Fall 2011
Problem Set #1    22 points

Due Tues. 9/20


**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**
    a. Discuss a phenomenon demonstrating the infinitude of human languages.
    b. 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 → ABC   A → Aa   A → a   B → Bb   B → b   C → c


**4.      5 points**
    Given the following PS grammar, provide the information requested in A-C.

    S → AB   A → aA   B → b   A → a

    A. Provide all of the equivalent derivations for the sentence *aab*.
    B. Give the (set theoretic) phrase marker for the sentence *aab*.
    C. 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. $a_n bfc_n$   (*abfc, aabfcc, aaabfccc*, etc.)
       where n is greater than 0  (n > 0)
    b. $b_n a_{n-1}$ (*bba, bbbaa*, etc.)      n > 1

    A. 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**.)
    B. Give derivations for 2 sentences from language a., and 2 from language b.