6.824 Artificial Intelligence, Fall 1994
Problem Set 1

Due: Beginning of class Friday, Sept. 16

Problem 1. Consider the following lexicon

a:	A
b:	B
h:	$A \times B \rightarrow C$
u:	$B \leftarrow A \times B$
v:	$A \rightarrow A$
w:	$A \leftarrow A$

Give all parenthesizations of the string "hvaaaawbuu" which correspond to parses of the string as category C under the above lexicon.

Problem 2. Consider the Lexicon

f:	A
f:	$A \rightarrow A$
f:	$A \leftarrow A$

Now consider a string "fff...fff" containing n fs. How many different parenthesizations of this string correspond to parses of the string as category A? Justify your answer. Also explain why for any string of n symbols there can not be more than 3^{3n} parenthesizations of that string. A considerably tighter upper bound is possible, but 3^{3n} is easier to prove.

Problem 3. Suppose that a lexicon has only one lexical entry per word and that only $\rightarrow$ is used in type expressions, i.e., all words precede their arguments. Prove that any string has at most one parse under such a lexicon. (Hint: You can prove the stronger statement that for any string and any type there is at most one prefix of the string which parses as that type. The proof is by induction on the length of the string.)

Problem 4. Give a specification for the semantic value of the determiner "only" similar to those in the notes for "some" and "every". The sentence ((only nerds) (love (every lecture))) should mean that anyone who loves every lecture is a nerd. In the notes two different meanings of the verb "eat" are given which yield two different quantifier scopings. Describe the two meanings of "Only nerds love every lecture" which correspond to the two analogous interpretations of the word "love".