Problem Set 6 — Due February 14, 2002

Problem 1. Exhibit a context free grammar for

$$L = \{a^n b^m : n \neq 2m\}.$$

Then describe an NPDA for the same language.

Problem 2. Consider the grammar $S \rightarrow AA$, $A \rightarrow AAA \mid bA \mid Ab \mid a$.

Part A. Describe, in careful English, the language of this grammar.

Part B. Show that this grammar is ambiguous.

Part C. Devise an unambiguous grammar for the same language and argue, informally, why your grammar is unambiguous.

Problem 3. In class we have shown that every regular language has a context-free grammar—in fact, it has a grammar in which every rule is of the form $A \rightarrow \varepsilon$ or $A \rightarrow aB$, where a is a terminal and A and B are variables. (Such a grammar is called a "regular grammar".) Show that the converse is also true: that regular grammar generates a regular language.

Problem 4 Prove that the context free languages are closed under reversal: if L is context free, so is L^R.