Assignment 6
Ling 106
Due April 15, 2002 in class

1. Consider the following context free grammar $G, G = < V, T, R, S >$, where

$$
R = \begin{align*}
S & \rightarrow aXbbC \\
X & \rightarrow aXbb \\
X & \rightarrow \epsilon \\
C & \rightarrow cC \\
C & \rightarrow c \\
C & \rightarrow \epsilon
\end{align*}
$$

(a) What are the variables (nonterminal symbols) of $G$?
(b) What are the terminal symbols of $G$?
(c) Give four examples of strings in $L(G)$.
(d) Give trees showing the derivation of each of the strings you listed in (c).
(e) Give four examples of strings not in $L(G)$.
(f) Is the following a correct description of $L(G)$?

$$\{a^i b^j c^k | i > 0, j = 2i, \text{ and } k \geq 0\}$$

If not, alter this description so that it is correct.

2. Consider the following language:

$$\{a^n b^n c^m d^m | n \geq 0 \text{ and } m \geq 1\}$$

Construct a context free grammar $G$ to generate this language.
(Hint: First construct a grammar $G_1$ for $\{a^n b^n | n \geq 0\}$. Then construct a grammar $G_2$ for $\{c^m d^m | m \geq 1\}$. Then concatenate the two according to the procedure discussed in class.)