1. Let $G = (\{S\}, \{a, b\}, P, S)$ be the CFG such that $P$ is given by

$$S \rightarrow aSb \mid aaSb \mid \varepsilon$$

(a) Show that $G$ is ambiguous.

(b) Give an unambiguous CFG $G'$ such that $L(G') = L(G)$. Prove that $G'$ is unambiguous and that $L(G') = L(G)$.

2. Define a PDA $M$ such that $L(M)$ is the set of all strings over \{0, 1\} with exactly twice as many 0s as 1s. Prove your answer.

3. Prove that for any PDA $P_1$ there is a PDA $P_2$ with only two stack symbols, such that $L(P_1) = L(P_2)$.

4. Prove that for any CFG $G = (V, T, P, S)$ and any $\alpha \in (V \cup T)^*$, $w \in T^*$, there is a leftmost derivation of $w$ from $\alpha$. You may not use parse trees in your proof; simply use the definition of $\Rightarrow$. 

CIS 770 Homework #6
Due 5:00 pm, March 4

Be ready to discuss problems 3 and 4 on Feb. 28.