CSE 322: Formal Models in Computer Science **Assignment #7**
November 24, 2008 Due: **Friday**, December 5, 2008

Reading Assignment: Sipser 3.1,3.2, 4.1,4.2

1. Let L be the language of all palindromes (strings w such that $w = w^R$) over $\{0, 1\}$ containing an equal number of 0s and 1s. Prove that L is not context-free.

2. Apply the Cocke-Kasami-Younger algorithm to the following Chomsky Normal Form grammar to show that the string *babbaa* is accepted (please show the tableau):

$$\begin{aligned} S &\rightarrow AB|BA|AT|BU|SS \\ T &\rightarrow SB|SU \\ U &\rightarrow SA \\ A &\rightarrow a \\ B &\rightarrow b \end{aligned}$$

3. Let $T = \{(i, j, k)|i, j, k \in \mathcal{N}\}$, where $\mathcal{N}$ is the set of natural numbers $\{1, 2, 3, \dots\}$. Prove that T is countable.

4. Sipser's text, 2nd edition, Exercise number 3.2, parts (b) and (d). (Same number and parts for the 1st edition.)

5. **Extra Credit:** To be done for the glory, not the points. Sipser's text, 2nd edition Problem 4.22 (1st edition Problem 4.20).