CSE 322 Spring 2005
Assignment #5

Due: Friday, May 13, 2005

Reading assignment: Reading Section 2.1 of Sipser's text and the handouts on Chomsky Normal Form and the CKY algorithm.

Problems:

1. Sipser's text, page 121, Problem 2.15.

2. Sipser's text, page 120, Exercise 2.4 part (e). Justify your grammar design.

3. Sipser's text. page 120, Exercise 2.6: For part (b) assume alphabet $\{a, b\}$. Justify your grammar designs.

4. Convert the following grammar to Chomsky normal form using the procedure on the handout.

$$
\begin{aligned}
S &\rightarrow A \mid ABa \mid AbA \\
A &\rightarrow Aa \mid \epsilon \\
B &\rightarrow Bb \mid BC \\
C &\rightarrow CB \mid CA \mid bB
\end{aligned}
$$

5. Sipser's text, page 121, Problem 2.19.

6. Sipser's text, page 121, Problem 2.21.

7. (Bonus) A CFG $G = (V, \Sigma, R, S)$ is *regular* (also known as *right-linear*) iff every rule of G is of the form $A \rightarrow wB$ or $A \rightarrow w$ for $w \in \Sigma^*$ and $A, B \in V$.

   In class we showed that every regular language is $L(G)$ for some regular grammar G. Complete the proof that regular grammars generate precisely the regular languages by showing that every regular grammar G, $L(G)$ is regular.

8. (Bonus) Sipser's text, page 122, Problem 2.25.