CSci 3501 Assignment 8

Due Friday, November 11th in class

Problem 1 (4 points). Consider the following grammar:

$$S \to SaS \mid aS \mid \epsilon$$

1. Prove that the grammar is ambiguous by showing a string that has at least two different parse trees; show the parse trees.
2. What language does the grammar generate?
3. Is it possible to generate the same language by an unambiguous grammar? If yes, please write the grammar and briefly explain why you think it is unambiguous. If not, please explain why.

Problem 2 (6 points). Sipser, exercise 2.4 b, c, d on p. 128.

Problem 3 (4 points). Sipser, exercise 2.6b p. 129.

Problem 4 (6 points). Sipser, exercise 2.14 p. 129.

Problem 5 (5 points). Sipser, exercise 2.26 p. 130. This is a very important result for future material. Think carefully about it. You may start with an example, but your final result must be a proof. Hint: use Chomsky normal form.

Problem 6 (5 points). Construct a context-free grammar and a PDA for the following language: $(ab)^k(ba)^{k+1}$, $k \geq 0$. For instance, strings ba and $abbaba$ are in the language.

Problem 7 (4 points). Sipser, exercise 2.12 p. 129.

Problem 8 (6 points). Construct PDAs for the languages in Sipser, exercise 2.5 (parts b,c only!) p. 129.