

**CSci 3501 Assignment 8**  
**Due Friday, November 10th in class**

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

$$S \rightarrow SaS \mid aS \mid \epsilon$$

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. 155.

**Problem 3 (4 points).** Sipser, exercise 2.6b p. 155.

**Problem 4 (5 points).** Sipser, exercise 2.14 p. 156.

**Problem 5 (5 points).** Sipser, exercise 2.26 p. 157. 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. Induction may be helpful.