CSE340 Spring 2020 - Homework 1

Due: Friday February 7 2020 by 11:59 PM on Gradescope

All submissions should be typed. Exception can only be made for drawing parse trees, which can be hand drawn and scanned in the submitted document.

When you submit your solution on Gradescope, you should indicate for each problem the page on which the solution is.

Problem 1. Consider the grammar

$S \rightarrow Y\ X\ Y$

$X \rightarrow a\ Y \mid Y$

$Y \rightarrow b\ b\ Y \mid X \mid \varepsilon$

where a and b are tokens. Remember that ε represent the empty string. $Y \rightarrow \varepsilon$ means that Y does not have to match any tokens.

1. Give a leftmost derivation for the string (sequence of tokens):

   bbabbabb

2. Give a rightmost derivation for the string (sequence of tokens):

   bbabbabb

Problem 2. Consider the grammar

$S \rightarrow X\ X\ X$

$X \rightarrow a\ Y \mid Y$

$Y \rightarrow b\ b\ Y \mid X \mid \varepsilon$

Draw a parse tree for the sequence of tokens

bbabbabb

The parse tree should have height less than or equal to 5.

Problem 3. Consider the grammar

$S \rightarrow a\ S\ b\ S\ c\ S$

$S \rightarrow A$

$A \rightarrow a\ S\ b\ S$

$A \rightarrow d$

1. What are the non-terminals?
2. What is the start symbol?
3. What are the terminals?

Explain your answers!

Problem 4. Show that the following grammar is ambiguous by giving a string that has two different leftmost derivations

$S \rightarrow A\ D \mid B\ C$

$A \rightarrow a\ A \mid b\ C$

$B \rightarrow A\ C\ D$

$C \rightarrow c\ C \mid D \mid \varepsilon$

$D \rightarrow C\ D \mid D\ D \mid a$

You should give the two derivations for the string you propose.