

# CS581 Worksheet # 4

Due by midnight, Thursday, April 25, Submit via D2L

## 1. Consider the context free grammar

$R \rightarrow RR \mid R + R \mid R^* \mid (R)$

$R \rightarrow \varepsilon \mid \emptyset$

$R \rightarrow A$

$A \rightarrow 0 \mid 1$

The above is an informal description of the grammar. Extract a formal description as a 4-tuple  $G = (V, \Sigma, R, S)$ . Use the conventions discussed in the text and the notes.

## 2. Using the grammar $G$ from question 1 above. Consider the string $0(1+0^*)1$ Provide

A. A derivation of string

B. A parse tree of your derivation

C. Do you recognize the strings derived by  $G$ ? Describe in English the language  $L(G)$ .

## 3. Prove that the grammar $G$ is ambiguous

1. Hint, find a string that has two leftmost derivations

## 4. Consider the PDA to the right.

Give a sequence of instantaneous descriptions (IDs, see the posted class notes for

Definition of ID) that show that the string

$aabcc$  is accepted by the PDA.

