

Chapter 3 & 4

- 1) (10) Given the grammar below, identify which sentences are in the language (which are valid sentence).

- a. baab
- b. bbbab
- c. bbaaaaaa
- d. bbaab

$$\langle S \rangle \rightarrow \langle A \rangle a \langle B \rangle b$$
$$\langle A \rangle \rightarrow \langle A \rangle b \mid b$$
$$\langle B \rangle \rightarrow a \langle B \rangle \mid a$$

- 2) (10) Identify all of the tokens (categories of lexemes) in the grammar below, and which lexemes they categorize. Put them in a table.

$$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$$
$$\langle \text{id} \rangle \rightarrow A \mid B \mid C$$
$$\langle \text{expr} \rangle \rightarrow \langle \text{id} \rangle + \langle \text{expr} \rangle$$
$$\mid \langle \text{id} \rangle * \langle \text{expr} \rangle$$
$$\mid (\langle \text{expr} \rangle)$$
$$\mid \langle \text{id} \rangle$$

- 3) (10) Given the grammar from question 2, show a left-most derivation and draw the parse tree for the following statement.

- a. $B = B + (C + (A * A))$

- 4) (10) Remove all of the recursion from the following grammar:

$$S \rightarrow Aa \mid Bb$$
$$A \rightarrow Aa \mid AbC \mid C$$
$$B \rightarrow S \mid bb$$
$$C \rightarrow c$$

- 5) (10) Use left factoring to resolve the pairwise disjointness problems in the following grammar:

$$A \rightarrow aBc \mid ac \mid a$$
$$B \rightarrow b \mid aB$$

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- 6) (20 pts) Create an LR(0) parse table for the following grammar. Show all steps (creating closures, the DFA, the transition table, and finally the parse table):

$E \rightarrow E + T \mid E * T \mid T$

$T \rightarrow (E) \mid \text{id}$

- 7) (20 pts) Show a complete bottom-up parse, including the parse stack contents, input string, and action for the string below using the parse table you created in step 6. Think about how I went through this in class.

$(\text{id} + \text{id}) * \text{id}$

- 8) (10 pts) Show a rightmost derivation for the string above, and show how the bottom-up parse you completed in step 7 correctly finds all of the handles for the input string above.