

# CMSC 330

## Practice Problems 2

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1. For the regular expressions  $(a|b)^*$  and  $(a^*|b^*)^*$ 
    - (a) Construct an NFA using the algorithm presented in class
    - (b) Reduce the NFA to a DFA using the Subset algorithm
    - (c) Minimize the DFA using Moore reduction
    - (d) Compare the two minimized DFAs. Are they identical up to state names?
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2. Write a grammar for the following languages
    - (a) All strings of 0's and 1's that have the same number of 0's and 1's
    - (b) All strings of 0's and 1's that have more 0's than 1's
    - (c) All balanced pairs of left and right parentheses (e.g., "()", "()((()))").
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3. Consider the grammar
$$S \rightarrow ( L ) \mid a$$
$$L \rightarrow L , S \mid S$$
and the strings "(a,a)" and "(a,(a,a))"

A left-most derivation is one which the left-most nonterminal is replaced in each step of the derivation. A right-most derivation is one which the right-most nonterminal is replaced in each step of the derivation.

- (a) Find all left-most derivations for each string
  - (b) Find all right-most derivations for each string
  - (c) Find the parse tree for each derivation
  - (d) Can you distinguish between the two parse trees?
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4. Consider the grammar
$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$
and the string "abab"

- (a) Find all left-most derivations for the string
- (b) Find all right-most derivations for the string
- (c) Find the parse tree for each derivation
- (d) Can you distinguish between the two parse trees?