

**PLC: Micro Assignment 3 [12.5 points]**

Due Thursday, Feb. 7, within first 3 minutes of class. You can volunteer to present one of your answers for 1 extra credit point. Preference will be given to students who have not presented yet.

1. This question is about the following regular grammar  $G$ , which has start symbol  $S$ , and nonterminals  $S$  and  $D$  (all other symbols are terminals):

$$\begin{array}{ll} S \rightarrow a b c S & D \rightarrow d D \\ S \rightarrow a b D & D \rightarrow \end{array}$$

- (a) Write out a step-by-step derivation of  $abcabdd$  from  $S$  [2 points].

- (b) Draw a finite automaton (possibly nondeterministic) accepting  $L(G)$  for the following regular grammar, with start symbol  $S$  and capitalized nonterminals. You can use the algorithm we saw in class Feb. 5th. [4 points]

*[turn over]*

2. This question is about the following grammar  $G$ , which has start symbol  $S$ , and nonterminals  $S$ ,  $A$ , and  $B$  (all other symbols are terminals):

$$\begin{array}{lll} S \rightarrow A B & A \rightarrow a A a & B \rightarrow b c B \\ & A \rightarrow & B \rightarrow \end{array}$$

- (a) Is the grammar regular or context-free? [2 points]
- (b) Write a step-by-step derivation of the following string from  $S$ , using the productions (rules) of the grammar:  $aaaabc$ . [4 points]
- (c) If you stated above that the grammar  $G$  is regular, draw an automaton recognizing  $L(G)$ , using the algorithm we saw in class Feb. 5th. If you stated that  $G$  is context-free, describe a regular grammar which accepts  $L(G)$ , or argue informally that there is no such. [0.5 points]