

Due: Tuesday, March 13
36 points

This homework is to be submitted at the beginning of class.

On homework, you may discuss with other students in the course about how to solve a problem, but the write-up should be your own. You **must include the names** of any students you consulted with. Give credit where credit is due. You may use JFLAP to check your answers for this assignment, but it must be written up and turned in.

1. (6 pts) Compute the First and Follow sets for each of the variables in the following grammar.

$$S \rightarrow SCB \mid Aef$$

$$A \rightarrow aAa \mid \lambda$$

$$B \rightarrow Bb \mid \lambda$$

$$C \rightarrow cC \mid d$$

	FIRST	FOLLOW
S		
A		
B		
C		

2. (8 pts) For the following grammar, compute the FIRST and FOLLOW sets for all the variables in the grammar. Then write out derivations of one or more strings that show each of the symbols in the FOLLOW sets following the appropriate variable. In the derivations, circle one instance of a terminal following a variable for each item in the FOLLOW set. Start each derivation with $S\$$ so $\$$ can be shown following variables. You will need to parse several strings to show all pairs. Note that the brute-force parser in JFLAP may not generate all pairs, but there is some string and derivation for each pair.

$$S \rightarrow ABC$$

$$A \rightarrow aA \mid B$$

$$B \rightarrow Bb \mid \lambda$$

$$C \rightarrow c \mid \lambda$$

	FIRST	FOLLOW
S		
A		
B		
C		

Show derivations:

3. (8 pts) Consider the following grammar (DO NOT change the grammar):

$$S \rightarrow AbC \mid d$$

$$A \rightarrow aA \mid \lambda$$

$$C \rightarrow Ac$$

For this problem you will construct the LL(1) parse table.

- (a) Calculate FIRST and FOLLOW for the variables in the grammar.

	FIRST	FOLLOW
S		
A		
C		

- (b) Calculate all entries in the LL(1) Parse Table. If there are multiple rules for an entry, write in all the rules.

	a	b	c	d	\$
S					
A					
C					

4. (8 pts) Consider the following grammar (DO NOT change the grammar):

$$\begin{aligned} S &\rightarrow aABd \\ A &\rightarrow aA \mid Bc \\ B &\rightarrow bBa \mid \lambda \end{aligned}$$

For this problem you will construct the LL(1) parse table.

- (a) Calculate FIRST and FOLLOW for the variables in the grammar.

	FIRST	FOLLOW
S		
A		
B		

- (b) Calculate all entries in the LL(1) Parse Table. If there are multiple rules for an entry, write in all the rules.

	a	b	c	d	\$
S					
A					
B					

5. (3 pts) The following grammar is LL(k) for what value of k?

$$\begin{aligned} S &\rightarrow bbCd \mid bbcc \\ C &\rightarrow cC \mid c \end{aligned}$$

6. (3 pts) The following grammar is LL(k) for what value of k?

$$\begin{aligned} S &\rightarrow ABdab \mid aCb \\ A &\rightarrow aA \mid a \\ B &\rightarrow b \mid ba \\ C &\rightarrow aabd \end{aligned}$$