Homework 4

1. (a) Consider the following grammar:

$$\begin{aligned} E &\rightarrow E + T \mid E - T \mid T \\ T &\rightarrow T * F \mid T/F \mid F \\ F &\rightarrow (E) \mid \text{id} \end{aligned}$$

Why is this grammar not LL? Give a rightmost derivation and parse tree for the following expression:
(id*id) + (id - id) / id

(b) Now consider an equivalent LL grammar:

$$\begin{aligned} E &\rightarrow TE' \\ E' &\rightarrow +TE' \mid -TE' \mid \epsilon \\ T &\rightarrow FT' \\ T' &\rightarrow *FT' \mid /FT' \mid \epsilon \\ F &\rightarrow (E) \mid id \end{aligned}$$

Give a leftmost derivation and parse tree for the same expression:
(id*id) + (id - id) / id

2. Consider the following LL grammar:

$$\begin{aligned} S &\rightarrow aB \mid bA \mid \epsilon \\ A &\rightarrow bAA \mid aS \\ B &\rightarrow aBB \mid bS \end{aligned}$$

(a) Compute the FIRST and FOLLOW sets for each nonterminal.

(b) Using the FIRST and FOLLOW sets, generate the predictive parsing table.

(c) Show the parsing action (including the matches, stack, input and action columns) for the string: aabbabbaa. Note that if your parsing does not work (which it should for this one!), you should simply show the parsing action up to the point where it gets stuck.

(d) Extra credit: Show a string (with at least 5 characters in it) that IS accepted by some parsing action for the table you generated in part (b).