编译原理 - 作业(2)：语法分析 LL

Q1: (p206, Exercise 4.2.1) Consider the context-free grammar:
$$S \rightarrow SS+ \mid SS* \mid a$$
and the string aa + a*.
  a) Give the leftmost derivation for the string.
  b) Give the rightmost derivation for the string.
  c) Give a parse tree for the string.
  d) Is the grammar ambiguous or unambiguous? Justify your answer.
  e) Describe the language generated by this grammar.

Q2: (p216, Exercise 4.3.1) The following is a grammar for regular expressions over symbols a and b only, using + in place of | for union, to avoid conflict with the use of vertical bar as a metasymbol in grammars:

$$rexpr \quad \rightarrow \ rexpr + rterm \mid rterm$$
$$rterm \quad \rightarrow \ rterm\, rfactor \mid rfactor$$
$$rfactor \quad \rightarrow \ rfactor * \mid rprimary$$
$$rprimary \rightarrow a \mid b$$

  a) Left factor this grammar.
  b) Does left factoring make the grammar suitable for top-down parsing?
  c) In addition to left factoring, eliminate left recursion from the original grammar.
  d) Is the resulting grammar suitable for top-down parsing?

Q3: Construct LL(1) parse table of the following grammar. Note: please list the detailed steps.

$$E \quad \rightarrow \ -E$$
$$E \quad \rightarrow \ (E) \mid Var\, T$$
$$T \quad \rightarrow \ -E \mid \varepsilon$$
$$Var \rightarrow \ id\, V$$
$$V \quad \rightarrow \ (E) \mid \varepsilon$$

Q4: Check whether the following G[S] grammar is an LL(1) grammar:

$$E \quad \rightarrow \ T\, E'$$
$$E' \quad \rightarrow \ A\, T\, E' \mid \varepsilon$$
$$T \quad \rightarrow \ F\, T'$$
$$T' \quad \rightarrow \ M\, F\, T' \mid \varepsilon$$
$$F \quad \rightarrow \ (E) \mid i$$
$$A \quad \rightarrow \ + \mid -$$
$$M \quad \rightarrow \ * \mid /$$