

1. Write your name in the space below.
2. Consider the the grammar  $G_1$ :

$$E \rightarrow E+T \mid E-T \mid T$$

$$F \rightarrow (E) \mid i$$

$$T \rightarrow F \mid T/F \mid T*F$$

For each of the following strings, either provide a leftmost derivation of the string from  $S$  or explain why the string is not in  $L(G_1)$ :  $i+i+i/i*i$ ;  $i-ii*i$ .

3. Is the grammar  $G_1$  ambiguous? Are its parse trees consistent with the usual interpretation of arithmetic symbols and expressions? Justify your answers.
4. Convert the grammar  $G_1$  of Question 2 to Chomsky normal form. Show intermediate grammars.

[additional space for answering the earlier question]

5. Provide informal and formal descriptions of a pushdown automaton that is equivalent to the grammar  $G_1$  of Question 2.