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# CS421: Homework 4

## Problem 1

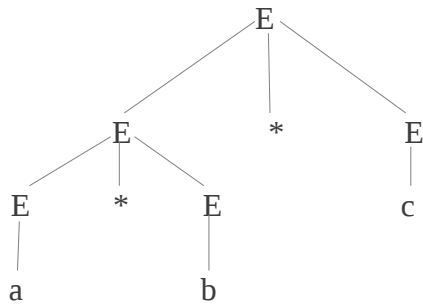let rec cst_to_ast t = match t with
    E1 (ge1,  t1, ge2)  → Sub (cst_to_ast (ge1), cst_to_ast (ge2))
   |  E2 (ge)  → cst_to_ast (ge)
   |  T1 (t1) → cst_to_ast (t1)
   |  T2 (ge, t1, t2)  → Times (cst_to_ast ge, cst_to_ast t2)
   |  Ident (s)  → Id (s);;
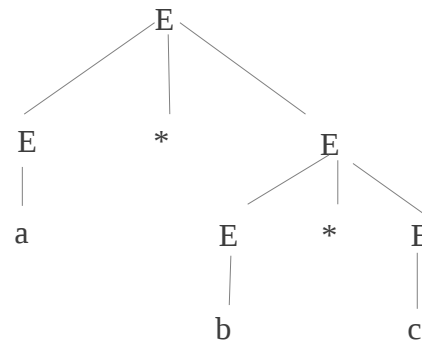   (* Should be no need to parse the Minus and Star token given current Grammar *)

## Problem 2

a.



b.

| Action | Stack | Input |
|---|---|---|
| Shift | | a*b*c |
| Reduce E → id | a | *b *c |
| Shift | E | *b *c |
| Shift | E * | b*c |
| Reduce E → id | E * b | *c |
| Reduce E → E*E | E * E | *c |
| Shift | E | *c |
| Shift | E * | c |

| Reduce E → id | E*c | |
|---|---|---|
| Reduce E → E*E | E*E | |
| Accept | E | |

c. Tree 1 is correct because it is the one that provides left multiplication associativity

d.
%left Plus
%left Star
%...
%%

**Problem 3**
%left Equivalency
%left Equal
%left Plus
%left Star
%...
%%

$G_E$:  $E \rightarrow E - T \mid T$
  $T \rightarrow id \mid T * id$
  $B \rightarrow T = T \mid E = T \mid T = E \mid E = E$
  $C \rightarrow T == T \mid E == T \mid T == E \mid E == E$