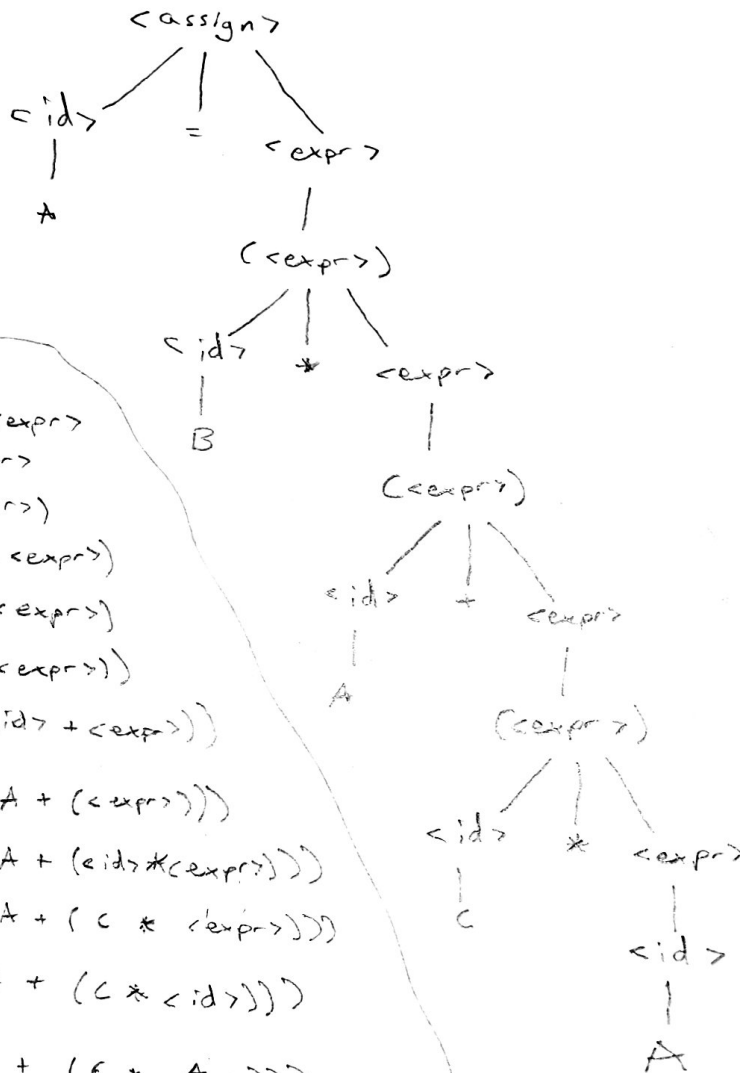


- #1 D. Orthogonality
 #2 G. Termination time
 #3 B. Stack-dynamic
 #4 B. Alias
 #5 E.

#6 $X = (B * (A + (C * A)))$



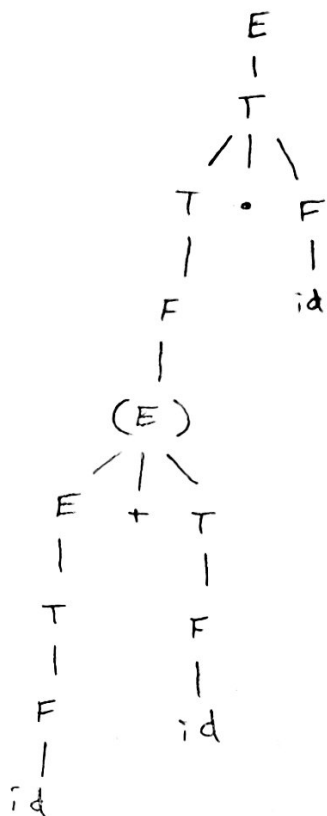
$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$
 $A = \langle \text{expr} \rangle$
 $A = (\langle \text{expr} \rangle)$
 $A = (\langle \text{id} \rangle * \langle \text{expr} \rangle)$
 $A = (B * \langle \text{expr} \rangle)$
 $A = (B * (\langle \text{expr} \rangle))$
 $A = (B * (\langle \text{id} \rangle + \langle \text{expr} \rangle))$
 $A = (B * (A + (\langle \text{expr} \rangle)))$
 $A = (B * (A + (\langle \text{id} \rangle * \langle \text{expr} \rangle)))$
 $A = (B * (A + (C * \langle \text{expr} \rangle)))$
 $A = (B * (A + (C * \langle \text{id} \rangle)))$
 $A = B * (A + (C * A))$

#7

Stack	Input	Action
	(id + id) . id \$	Shift 4
0 (4	id + id) . id \$	Shift 5
0 (4 id 5	+ id) . id \$	Reduce 6, Goto(4, F)
0 (4 F 3	+ id) . id \$	Reduce 4, Goto(4, T)
0 (4 T 2	+ id) . id \$	Reduce 2, Goto(4, E)
0 (4 E 8	+ id) . id \$	Shift 6
0 (4 E 8 + 6	id) . id \$	Shift 5
0 (4 E 8 + 6 id 5) . id \$	Reduce 6, Goto(6, F)
0 (4 E 8 + 6 F 3) . id \$	Reduce 4, Goto(6, T)
0 (4 E 8 + 6 T 9) . id \$	Reduce 1, Goto(4, E)
0 (4 E 8) . id \$	Shift 11
0 (4 E 8) 11	. id \$	Reduce 5, Goto(0, F)
0 F 3	. id \$	Reduce 4, Goto(0, T)
0 T 2	. id \$	Shift 7
0 T 2 . 7	id \$	Shift 5
0 T 2 . 7 id 5	\$	Reduce 6, Goto(7, F)
0 T 2 . 7 F 10	\$	Reduce 3, Goto(0, T)
0 T 2	\$	Reduce 2, Goto(0, E)
0 E 1	\$	Accept

Outside parentheses don't do anything

#7 continued (parse tree)
 again ignoring total parentheses because they don't do anything
 (id + id) . id



#8
 $\langle \text{expr} \rangle \rightarrow \{ \langle \text{expr} \rangle (+|-) \}^* \langle \text{term} \rangle$
 $\langle \text{term} \rangle \rightarrow \{ \langle \text{term} \rangle (\cdot | /) \}^* \langle \text{factor} \rangle$
 $\langle \text{factor} \rangle \rightarrow \langle \text{exp} \rangle \{ \epsilon \cup \langle \text{factor} \rangle \}$
 $\langle \text{exp} \rangle \rightarrow (\langle \text{expr} \rangle | \text{id})$

#10

deep1: a/deep1, b/deep1, g/main - read only

deep2: c/deep2, b/deep2, g/main - read and write, a/deep1 - read only

deep3: c/deep3, g/deep3, a/deep1 - read only, b/deep2 - read only

Output: (3, 5, 2)

(15, 5, 2, 7)

(5, 2, 11, 4)