

## Homework 2

1 Given the grammar below, identify which sentences are in the language

$\langle S \rangle \rightarrow \langle A \rangle a \langle B \rangle b$

$\langle A \rangle \rightarrow \langle A \rangle b \mid b$

$\langle B \rangle \rightarrow a \langle B \rangle \mid a$

a. baab

b. bbbab

c. bbaaaaaa

d. bbaab

2 Tokens / Lexemes

Id	A, B, C
assignment	=
operators	+ *
Left paren	(
Right paren	)

3 Left-Most derivation  $B = B + (C + (A * A))$

Assign  $\rightarrow \langle id \rangle = \langle expr \rangle$

$\rightarrow B = \langle expr \rangle$

$\rightarrow B = \langle id \rangle + \langle expr \rangle$

$\rightarrow B = B + \langle expr \rangle$

$\rightarrow B = B + (\langle expr \rangle)$

$\rightarrow B = B + (\langle id \rangle + \langle expr \rangle)$

$\rightarrow B = B + (C + \langle expr \rangle)$

$\rightarrow B = B + (C + (\langle expr \rangle))$

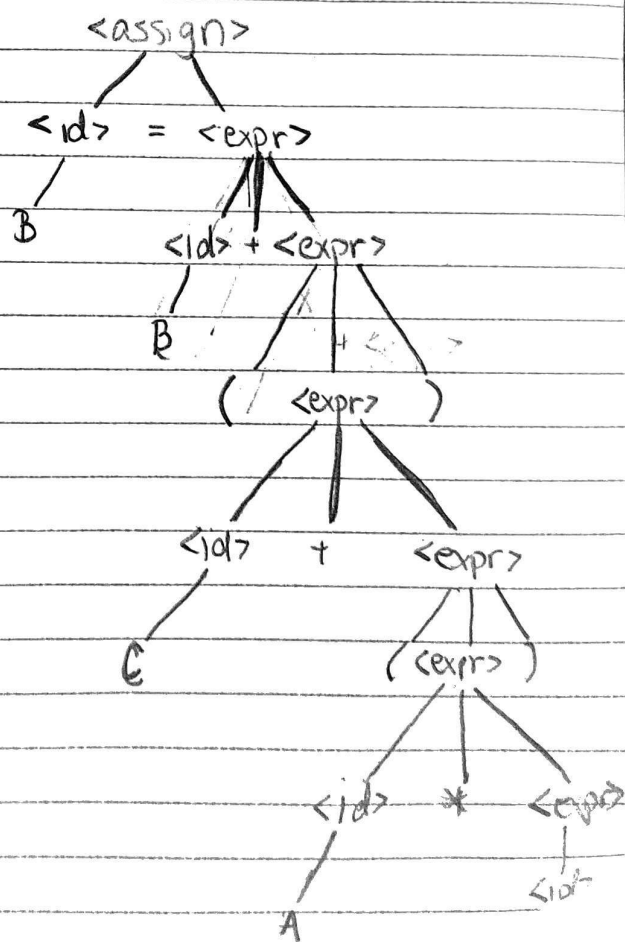
$\rightarrow B = B + (C + (\langle id \rangle * \langle expr \rangle))$

$\rightarrow B = B + (C + (A * \langle expr \rangle))$

$\rightarrow B = B + (C + (A * \langle id \rangle))$

$\rightarrow B = B + (C + (A * A))$

Parse Tree



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Remove all recursion

 $A \rightarrow Aa|C$      $A \rightarrow AaC|C$  $S \rightarrow Aa|Bb$  $S \rightarrow CA' \mid A \rightarrow CA'$  $A \rightarrow Aa|AaC|C$  $A' \rightarrow Aa' \mid \epsilon$      $A' \rightarrow aCA' \mid \epsilon$  $B \rightarrow S|bb$  $A \rightarrow CA' \mid A' \mid \epsilon$  $C \rightarrow c$  $A' \rightarrow aA' \mid aCA' \mid \epsilon$  $S \rightarrow Aa|Bb$  $\rightarrow S \rightarrow Aa|Sb|bbB$  $S \rightarrow AaS' \mid bbbS'$  $A \rightarrow CA'$  $A \rightarrow CA'$  $S' \rightarrow bS' \mid \epsilon$  $A' \rightarrow aA' \mid aCA' \mid \epsilon$  $A' \rightarrow aA' \mid aCA' \mid \epsilon$  $B \rightarrow S|bb$  $C \rightarrow c$  $C \rightarrow c$ 

Final Grammar

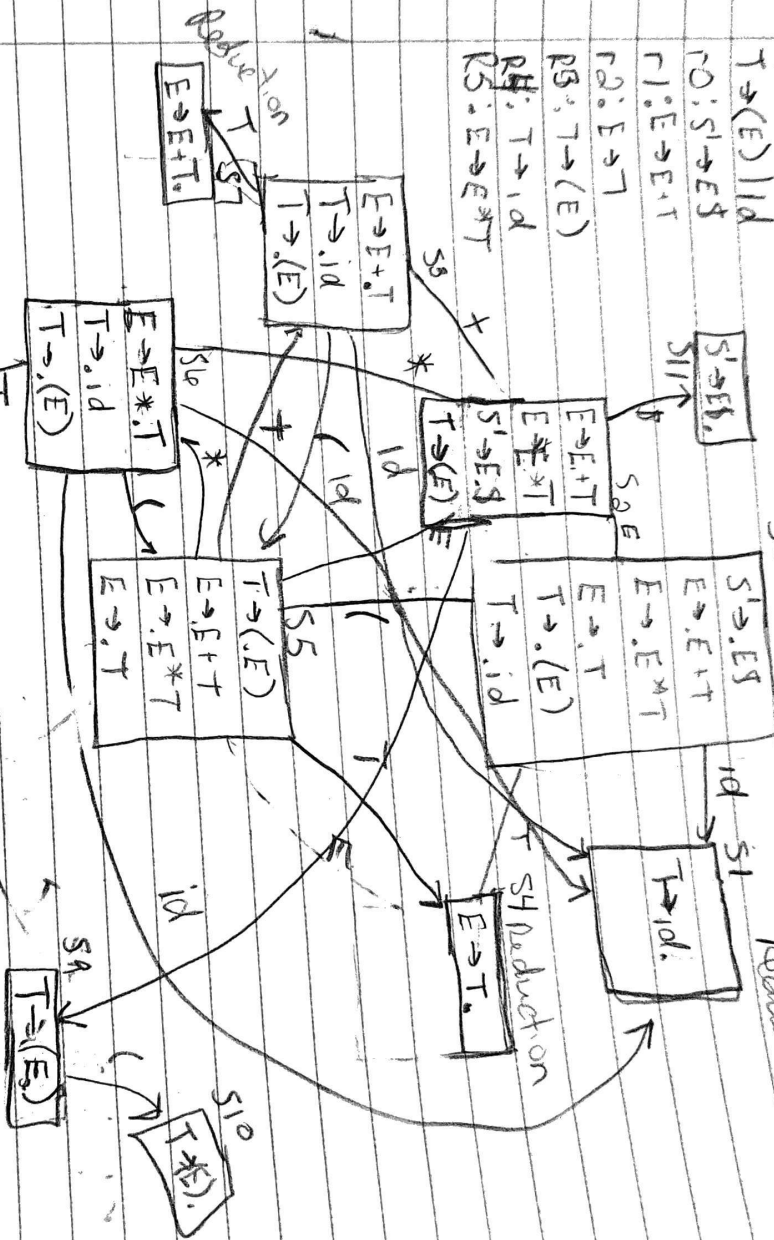
 $S \rightarrow AaS' \mid bbbS'$  $S' \rightarrow bS' \mid \epsilon$  $A \rightarrow CA'$  $A' \rightarrow aA' \mid aCA' \mid \epsilon$  $C \rightarrow c$ 

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 $A \rightarrow aBc|ac|a$  $A \rightarrow aA'$  $B \rightarrow b|aB$  $A' \rightarrow Bc|c|\epsilon$  $B \rightarrow b|aB$

LR  $E \rightarrow E+T \mid E*T \mid T$

S0 Reduce



10	id	E	T	+	*	(	)	\$
9								
8								
7								
6								
5								
4								
3								
2								
1								
0								



8  $E \rightarrow E * T$

$\rightarrow E * 1_d$

$\rightarrow T * 1_d$

$\rightarrow (E) * 1_d$

$\rightarrow (E + T) * 1_d$

$\rightarrow (T + 1_d) * 1_d$

$\rightarrow (1_d + 1_d) * 1_d$