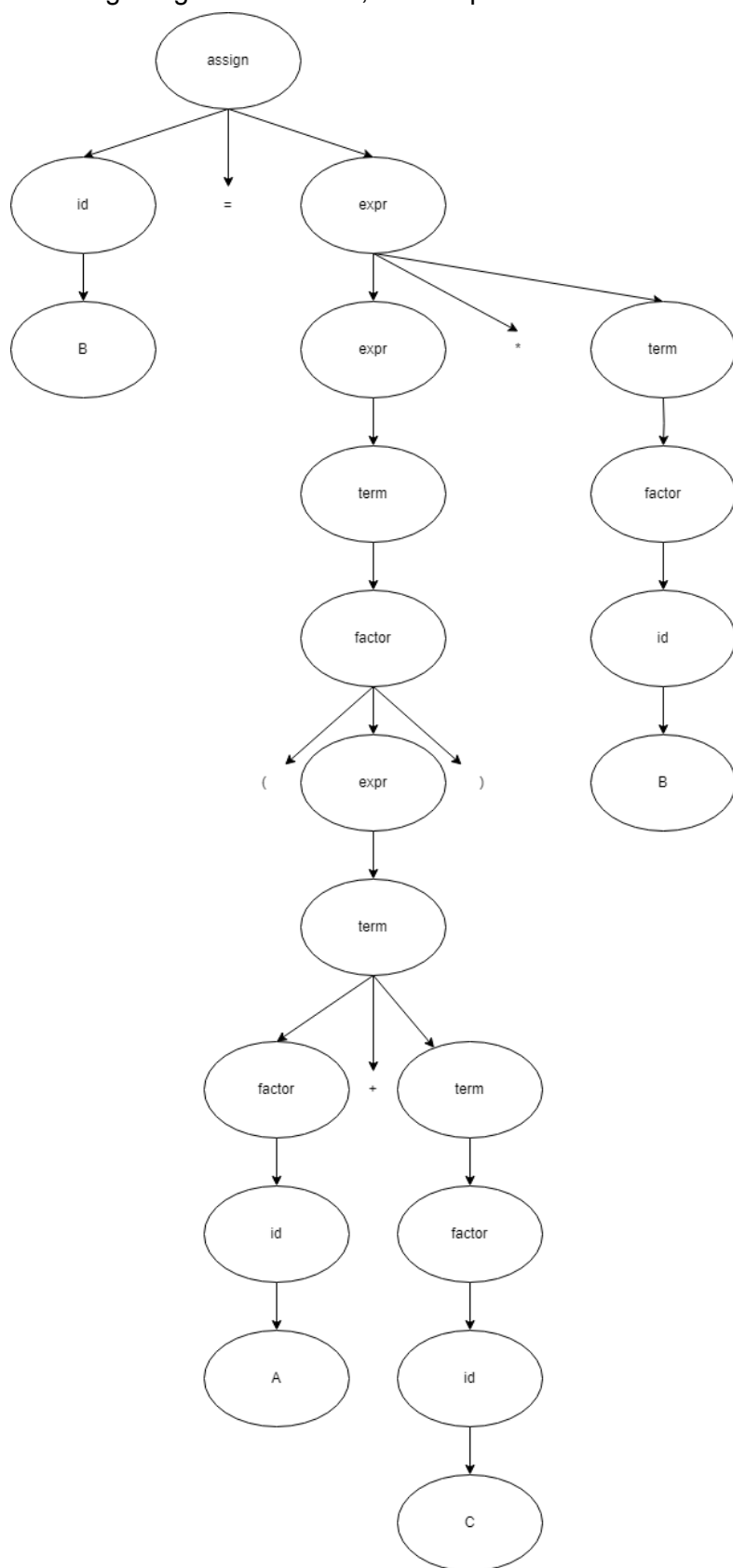


CS 381 Homework 3 – Syntax

1. Using the grammar below, show a parse tree and a leftmost derivation for the sentence



CS 381 Homework 3 – Syntax

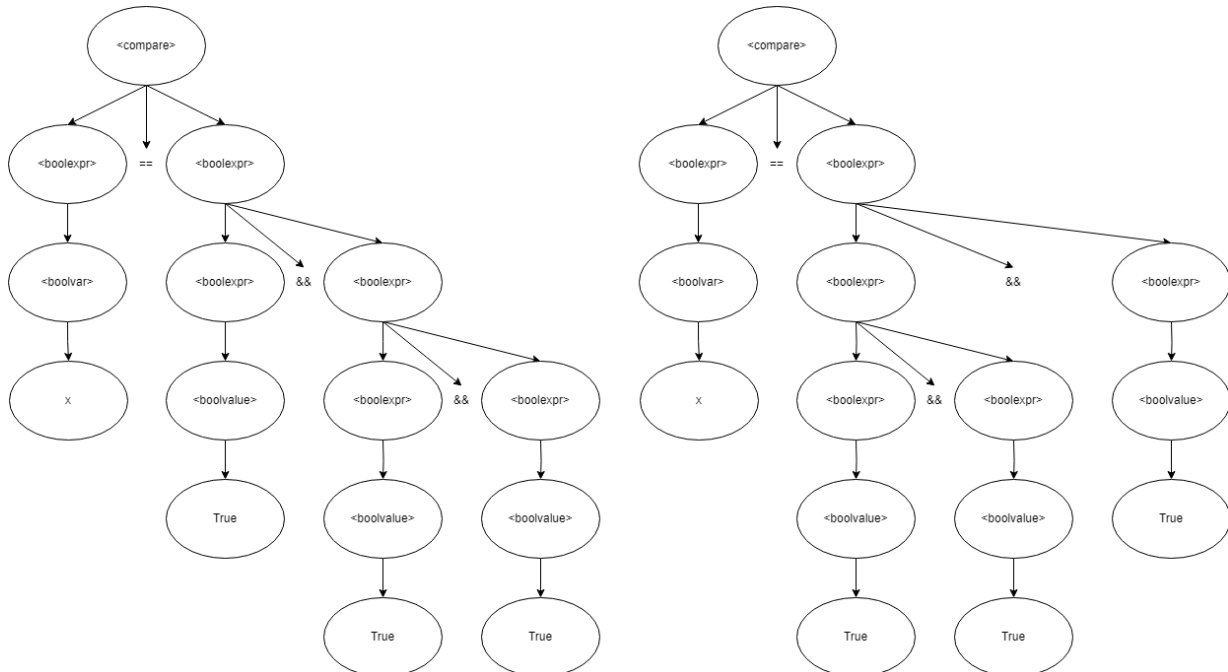
$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$
 $\langle \text{assign} \rangle \rightarrow B = \langle \text{expr} \rangle$
 $\langle \text{assign} \rangle \rightarrow B = \langle \text{expr} \rangle * \langle \text{term} \rangle$
 $\langle \text{assign}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

2. Rewrite the following BNF to add the postfix ++ and -- unary operators of Java

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

3. Show that the following grammar is ambiguous. Note: The terminals symbols are in bold.

We observe two distinct trees to generate the sentential form $x = \text{True} \ \&\& \ \text{True} \ \&\& \ \text{True}$, thus showing that the grammar is ambiguous.



CS 381 Homework 3 – Syntax

4. Write a grammar G for the language L consisting of strings of 0's and 1's that are the binary representation of odd integers greater than 4.

$G = \{ N, \Sigma, P, S \}$

$N = \{ S, A \}$

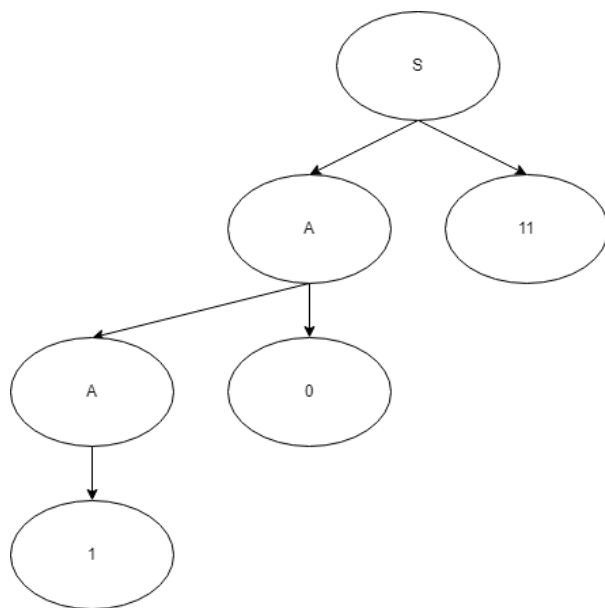
$\Sigma = \{ 01, 11, 1, 0 \}$

$P = \{ (S, A01), (S, A11), (A, A1), (A, A0), (A, 1), (A, 0) \}$

$P: S \rightarrow A01 \mid A11$

$A \rightarrow A1 \mid A0 \mid 1 \mid 0$

Parse tree for 1011:



Parse tree for 1101:

