

HOMEWORK 1

Homework 1

Yuji Shimojo

CMSC 330

Instructor: Prof. Reginald Y. Haseltine

June 9, 2013

HOMEWORK 1

Question

(Adapted from Sebasta (2012) Chapter 3 Problem 7)

Using the grammar in text Example 3.4 (with terminals X, Y, and Z vs. A, B, and C), show a leftmost derivation and a parse tree for the following statement:

$$X = (X * Y) + ((X + Y) * Z)$$

Example 3.4 Grammar for Expression

$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle \Rightarrow X \mid Y \mid Z$

$\langle \text{expr} \rangle \Rightarrow \langle \text{expr} \rangle + \langle \text{term} \rangle \mid \langle \text{term} \rangle$

$\langle \text{term} \rangle \Rightarrow \langle \text{term} \rangle * \langle \text{factor} \rangle \mid \langle \text{factor} \rangle$

$\langle \text{factor} \rangle \Rightarrow (\langle \text{expr} \rangle) \mid \langle \text{id} \rangle$

My Answer

Leftmost Derivation

$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\Rightarrow X = \langle \text{expr} \rangle$

$\Rightarrow X = \langle \text{expr} \rangle + \langle \text{term} \rangle$

$\Rightarrow X = \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow X = \langle \text{factor} \rangle + \langle \text{term} \rangle$

$\Rightarrow X = (\langle \text{expr} \rangle) + \langle \text{term} \rangle$

$\Rightarrow X = (\langle \text{term} \rangle) + \langle \text{term} \rangle$

$\Rightarrow X = (\langle \text{term} \rangle * \langle \text{factor} \rangle) + \langle \text{term} \rangle$

HOMEWORK 1

$$\Rightarrow X = (\langle \text{factor} \rangle * \langle \text{factor} \rangle) + \langle \text{term} \rangle$$

$$\Rightarrow X = (\langle \text{id} \rangle * \langle \text{factor} \rangle) + \langle \text{term} \rangle$$

$$\Rightarrow X = (X * \langle \text{factor} \rangle) + \langle \text{term} \rangle$$

$$\Rightarrow X = (X * \langle \text{id} \rangle) + \langle \text{term} \rangle$$

$$\Rightarrow X = (X * Y) + \langle \text{term} \rangle$$

$$\Rightarrow X = (X * Y) + \langle \text{factor} \rangle$$

$$\Rightarrow X = (X * Y) + (\langle \text{expr} \rangle)$$

$$\Rightarrow X = (X * Y) + (\langle \text{term} \rangle)$$

$$\Rightarrow X = (X * Y) + (\langle \text{term} \rangle * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + (\langle \text{factor} \rangle * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((\langle \text{expr} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((\langle \text{expr} \rangle + \langle \text{term} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((\langle \text{term} \rangle + \langle \text{term} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((\langle \text{factor} \rangle + \langle \text{term} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((\langle \text{id} \rangle + \langle \text{term} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + \langle \text{term} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + \langle \text{factor} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + \langle \text{id} \rangle) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + Y) * \langle \text{factor} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + Y) * \langle \text{id} \rangle)$$

$$\Rightarrow X = (X * Y) + ((X + Y) * Z)$$

HOMEWORK 1

Parse Tree

