Question

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

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

\[ X = (X \times Y) + ((X + Y) \times Z) \]

Example 3.4 Grammar for Expression

<assign> => <id> = <expr>

<id> => X | Y | Z

<expr> => <expr> + <term> | <term>

<term> => <term> * <factor> | <factor>

<factor> => ( <expr> ) | <id>

My Answer

Leftmost Derivation

<assign> => <id> = <expr>

=> X = <expr>

=> X = <expr> + <term>

=> X = <term> + <term>

=> X = <factor> + <term>

=> X = ( <expr> ) + <term>

=> X = ( <term> ) + <term>

=> X = ( <term> * <factor> ) + <term>
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\[ => X = ( \text{<factor>} \times \text{<factor>}) + \text{<term>} \]

\[ => X = ( \text{<id>} \times \text{<factor>}) + \text{<term>} \]

\[ => X = (X \times \text{<factor>}) + \text{<term>} \]

\[ => X = (X \times \text{id}) + \text{<term>} \]

\[ => X = (X \times Y) + \text{<term>} \]

\[ => X = (X \times Y) + \text{<factor>} \]

\[ => X = (X \times Y) + (\text{<expr>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (\text{<term>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (\text{<factor>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (\text{<id>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (X + \text{<term>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (X + \text{<expr>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (X + \text{<id>} \times \text{<factor>}) \]

\[ => X = (X \times Y) + (X + Y \times \text{<factor>}) \]

\[ => X = (X \times Y) + (X + Y \times \text{id}) \]

\[ => X = (X \times Y) + (X + Y \times Z) \]
HOMEWORK 1

Parse Tree