

Evaluation of polynomials expressions

Objective: The user will input a multi-variable polynomial expression in a valid format. The user will then enter the values of the variables used, upon the validation of expression. The program will then evaluate the polynomial and give the result of the expression

Sample input 1:

Enter the expression:

$7x^3+4x^2y+8y^2(5x+3)+3z$ //user input equivalent to $7x^3+4x^2y+8y^2(5x+3)+3z$

Expression accepted.

Enter the values of x y z

2

3

5

The answer is : 1055

Sample input 2:

Enter the expression:

$7x^3+4x^2y+8y^2(5x+3(5z))+3z$

Invalid expression.

Note: Handling of exceptions such as invalid characters, divide by zero, parenthesis mismatch and other format errors are appropriately incorporated in the code.

Data Structures used: Array (static and dynamic), linked list, stack and queue

Algorithm and working of the code

The input of the user is accepted in a **character array**. The expression is subjected to some tests to check its validity. Initially blank spaces, if any, are removed from the expression. Then firstly presence of invalid characters are checked (such as &, >, " etc). Then the operator sequencing is checked (e.g. $7y^*$, $z++5$, $x+(/5)$ etc).

Lastly parenthesis balancing is checked. For checking balancing of parenthesis, we take the help of stack. If the expression passes each and every test, the program execution moves further or else an error statement is printed and program stops executing further.

Next, the program asks user to input values for the variables used. The program scans the character array and detects the number of variables used and takes input accordingly.

Now the expression is suitably modified to ease the calculations. For this, each and every character of the expression is loaded in a queue and proper operators (especially product operator) are inserted.

To evaluate the polynomial, a two step process is followed. The expression, after replacing its variables with corresponding values, is converted into postfix with the help of a stack. The postfix expression is then evaluated and we get the final output.