Polynomial Calculator

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1)Project Desciption:

A polynomial calculator in Java is a program that performs mathematical operations on polynomials, which are expressions containing one or more variables and coefficients. To create a polynomial calculator in Java, we need to design and implement two classes: a Polynomial class and a Monomial class.

The Polynomial class represents a polynomial expression and contains methods for performing arithmetic operations on polynomials, such as adding, subtracting, multiplying, dividing, differentiating, and integrating. The Monomial class represents a single term in a polynomial expression and contains a coefficient and a degree.

To create a user interface for the polynomial calculator, we can use the Java Swing library to build a graphical user interface (GUI). The GUI should contain text fields for the first polynomial, the second polynomial, and the result, as well as buttons for performing the arithmetic operations. When the user clicks on a button, the calculator should perform the corresponding operation and display the result in the result text field.

To test the methods in the Polynomial and Monomial classes, we can use JUnit, a testing framework for Java. We can create test cases that check whether the methods return the correct results for different input values. For example, we can test the add method by creating two polynomials with different terms and verifying that the sum of the polynomials is computed correctly.

Overall, a polynomial calculator in Java with a GUI and JUnit testing can provide a convenient and reliable tool for performing arithmetic operations on polynomials.

2)Class Diagram

GUI

Controller

Monomial

Polynomial

Application

3) Use cases

1. Addition of polynomials:
   * User inputs two polynomials, such as "3x^2 + 4x - 1" and "2x^3 + 5x^2 - 2x + 3".
   * User clicks the "Add" button.
   * The program calculates the sum of the two polynomials: "2x^3 + 8x^2 + 2x + 2".
   * The program displays the result in the result text field.
2. Subtraction of polynomials:
   * User inputs two polynomials, such as "3x^2 + 4x - 1" and "2x^3 + 5x^2 - 2x + 3".
   * User clicks the "Subtract" button.
   * The program calculates the difference between the two polynomials: "-2x^3 - 2x^2 + 6x - 4".
   * The program displays the result in the result text field.
3. Multiplication of polynomials:
   * User inputs two polynomials, such as "3x^2 + 4x - 1" and "2x^3 + 5x^2 - 2x + 3".
   * User clicks the "Multiply" button.
   * The program calculates the product of the two polynomials: "6x^5 + 23x^4 + 5x^3 - 7x^2 - 8x + 3".
   * The program displays the result in the result text field.
4. Division of polynomials:
   * User inputs two polynomials, such as "3x^2" and "x".
   * User clicks the "Divide" button.
   * The program calculates the quotient and remainder of the two polynomials: "3x " and "0".
   * The program displays the quotient and remainder in the result text field.
5. Differentiation of a polynomial:
   * User inputs a polynomial, such as "3x^2 + 4x - 1".
   * User clicks the "Differentiate" button.
   * The program calculates the derivative of the polynomial: "6x + 4".
   * The program displays the result in the result text field.
6. Integration of a polynomial:
   * User inputs a polynomial, such as "3x^2 + 4x - 1".
   * User clicks the "Integrate" button.
   * The program calculates the indefinite integral of the polynomial: "x^3 + 2x^2 - x + C".
   * The program displays the result in the result text field.