SWE 501 – Introduction to Object-oriented Programming
Assignment 2 Report - Integral Computation

Ali Şer Gök
ID: 2022719075
Date: 04.01.2023

Polynomial (class)

I wrote a Polynomial class to represent polynomial functions. This class includes the following methods:

Polynomial(): I wrote a constructor that takes no arguments. This creates an empty Polynomial object.
Polynomial(double a, double b, double c, double d): I wrote a constructor that takes four coefficients (‘a’, ‘b’, ‘c’, ‘d’) and stores them in an ArrayList. These coefficients represent a polynomial of the form: “ax^3 + bx^2 + cx + d”.
double valueAt(double x): This method calculates the value of the polynomial at a given point (x). I add up the product of each coefficient with ‘x’ raised to the corresponding degree (determined by the position in the ArrayList).
void ‘setDeltaX(double deltaX)’: This method allows setting the ‘deltaX’ variable, which determines the interval size used in the ‘computeIntegral()’ method.
double computeIntegral(double minX, double maxX): This method calculates the integral of the polynomial within a given range (specified by ‘minX’ and ‘maxX’). This is done by summing the area of squares for each interval in the range. This is done by looping from ‘minX’ to ‘maxX’ in increments of ‘deltaX’ and using the ‘valueAt()’ method to calculate the polynomial value at each point, then multiplying by ‘deltaX’ and adding to a running total called integral.

Main (class)

In the main method, I did the following:

I obtained the four coefficients of the polynomial from the user using a Scanner object.
I created a Polynomial object using these coefficients.
I requested the ‘minX’ and ‘maxX’ values from the user for calculating the integral.
I set the ‘deltaX’ value using the ‘setDeltaX()’ method as the interval size used in the ‘computeIntegral()’ method.
I used the ‘computeIntegral()’ method to calculate the integral of the polynomial within the specified range and printed the result.

Program Outputs:

f(x) = x^2 -2 in the range (0,2)
deltaX=0.0001

```
-1.3333333300005208
```

f(x) = 9x^2-2x-18 in the range (-2,3)
deltaX=0.0001

```
9.998250075023178
```

f(x) = 3x^3-2x-15 in the range (-4,3)
deltaX=0.0001

```
-229.26295005179566
```

f(x) = 3 in the range (-6,6)
deltaX=0.0001

```
36.00029999998575
```

Visual output: