PPS

Programming for Problem Solving

Mini Project

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Problem Statement

Write a program in C to calculate the value of the polynomial after differentiation or integration as per the user’s choice.

Analysis:

* Accept User choice
* Accept the equation
* Calculate the Derivative or the Integral
* Display the value of the Polynomial
* Display the value of the Derivative or the Integral

FDT-Function Description Table

|  |  |  |  |
| --- | --- | --- | --- |
| Function Name | Return Type | Purpose | Parameter List |
| main | int | To take user’s inputs | - |
| poly | float | To calculate the value of the polynomial | float a[], int deg, float x |
| deriv | float | To calculate the value of the Derivative | float a[], int deg, float x |
| integ | float | To calculate the value of the Integral | float a[], int deg, float x |

Algorithm

int main ():-

1. Start
2. Accept user choice
3. If the choice is 1 then,

* Accept the polynomial and value of x
* Call the poly() and deriv() functions
* Display the answers

1. If the choice is 2 then,

* Accept the polynomial and value of x
* Call the poly() and integ() functions
* Display the answers

1. If the choice is 3 then,

* Display Thank You message
* Terminate the program

1. If the choice is anything else then,

* Display Wrong choice
* Accept the user choice again

1. Return the value 0
2. Stop

float poly (float a[], int deg, float x):-

1. Start
2. Repeat the step for all values of a[]

* value = (value of a at i) + (x\*value)

1. Return the calculated value
2. Stop

float deriv (float a[], int deg, float x):-

1. Start
2. Repeat the steps for all values of a[]

* variable1 = x ^ (deg - (i + 1))
* variable2 = (deg – i) \* (value of a at (deg - i)) \* variable1
* value = value + variable2

1. Return the calculated value
2. Stop

float integ (float a[], int deg, float x):-

1. Start
2. Repeat the steps for all values of a[]

* variable1 = (x ^ (i + 1)) / (i + 1)
* variable2 = (value of a at i) \* variable1
* value = value + variable2

1. Return the calculated value
2. Stop

Source Code

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Differential and Integral Calculator

Calculates the value of the equation after differentiation or integration as per user's choice

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#include <stdio.h>

#include <math.h>

float poly(float a[], int, float); //function to calculate the value of the Polynomial

float deriv(float a[], int, float); //function to calculate the value of the Differential

float integ(float a[], int, float); //function to calculate the value of the Integral

int main()

{

float x, a[10], y, dy, Iy;

int deg, i, ch;

do

{

printf("Enter a choice :-\n1)Differential Calculator\n2)Integral Calculator\n3)Quit\n");

scanf("%d", &ch);

switch(ch) //Calculation on the basis of user's choice

{

case 1: // Differential

printf("Degree of Polynomial Equation: ");

scanf("%d", &deg);

printf("Enter the value of x: ");

scanf("%f", &x);

for(i = 0; i <= deg; i++)

{

printf("Enter the coefficient of x to the power %d: ", i);

scanf("%f", &a[i]);

}

y = poly(a, deg, x);

printf("The value of Polynomial Equation = %.2f", y);

dy = deriv(a, deg, x);

printf("\nThe value of the Derivative = %.2f\n", dy);

break;

case 2: //Integral

printf("Degree of Polynomial Equation: ");

scanf("%d", &deg);

printf("Enter the value of x: ");

scanf("%f", &x);

for(i = 0; i <= deg; i++)

{

printf("Enter the coefficient of x to the power %d: ", i);

scanf("%f", &a[i]);

}

y = poly(a, deg, x);

printf("The value of Polynomial Equation = %.2f", y);

Iy = integ(a, deg, x);

printf("\nThe value of the Integral = %.2f\n", Iy);

break;

case 3: //Quit

printf("Thank You!");

goto A;

default:

printf("Wrong choice!! Enter the choice again!\n");

}

}while(1);

A:

return 0;

}

float poly(float a[], int deg, float x)

{

float p = a[deg];

int i;

for(i = deg; i >= 1; i--) //Calculation of the Polynomial

p = (a[i - 1] + x \* p);

return p;

}

float deriv(float a[], int deg, float x)

{

float d[10], pd = 0, ps;

int i;

for (i = 0; i <= deg; i++) //Calculation of the Differential

{

ps = pow(x, deg - (i + 1));

d[i] = (deg - i) \* a[deg - i] \* ps;

pd = pd + d[i];

}

return pd;

}

float integ(float a[], int deg, float x)

{

float d[10], pd = 0, ps;

int i;

for (i = 0; i <= deg; i++) //Calculation of the Integral

{

ps = pow(x, (i + 1))/(i+1);

d[i] = a[i] \* ps;

pd = pd + d[i];

}

return pd;

}

VDT-Variable Description Table

Sample Input Output

|  |  |  |  |
| --- | --- | --- | --- |
| Variable Name | Data Type | Purpose | Scope |
| x | float | To accept the value of x | main() |
| y | float | To store the value of the Polynomial | main() |
| dy | float | To store the value of the Derivative | main() |
| Iy | float | To store the value of the Integral | main() |
| a[] | float | To store the coefficients of the terms | main() |
| deg | int | To accept the degree of the Polynomial | main() |
| i | int | LCV-Loop Control Variable | main() |
| ch | int | To accept the user choice | main() |
| p | float | To calculate the value of the polynomial | poly() |
| d[] | float | To calculate the Derivative and Integral | deriv(), integ() |
| ps | float | To store the derivative of each power of x | deriv(), integ() |
| pd | float | To store the final answer | deriv(), integ() |

Sample Input Output

Enter a choice:-

1) Differential Calculator

2) Integral Calculator

3) Quit

1

Degree of Polynomial Equation: 3

Enter the value of x: 4

Enter the coefficient of x to the power 0: 0

Enter the coefficient of x to the power 1: 0.5

Enter the coefficient of x to the power 2: 6

Enter the coefficient of x to the power 3: 5.5

The value of Polynomial Equation = 450.00

The value of the Derivative = 312.50

Enter a choice:-

1) Differential Calculator

2) Integral Calculator

3) Quit

2

Degree of Polynomial Equation: 4

Enter the value of x: 3.5

Enter the coefficient of x to the power 0: 7

Enter the coefficient of x to the power 1: 2.5

Enter the coefficient of x to the power 2: 4.7

Enter the coefficient of x to the power 3: 9

Enter the coefficient of x to the power 4: 2

The value of Polynomial Equation = 759.33

The value of the Integral = 654.71

Enter a choice:-

1) Differential Calculator

2) Integral Calculator

3) Quit

6

Wrong choice!! Enter the choice again!

Enter a choice:-

1) Differential Calculator

2) Integral Calculator

3) Quit

3

Thank You!