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**Practical 13: Lagrange’s Interpolation Formula**

**Objective:** To find value of y corresponding given value of x using Lagrange’s Interpolation Formula for unequal intervals.

**2. Algorithm:**

1. Start
2. Input the matrix of equations in arr[n][2] where n is number of given variables in data.
3. Calculate the difference table using:

For (j = 2; j < n+1; j++)

{

For (i = 0; i < n-j+1; i++)

{

mat[i][j]= mat[i][j-1]- mat[i-1][j-1];

}

}

1. Enter the value of x.
2. Find value of y using:

sum=0.0;

for i in range(n)

{

z= 1.0

for j in range(n)

{

if (i!=j)

{

z \*= (x - mat[j][0])

z /= (mat[i][0] - mat[j][0]

}

}

z\*=mat[i][1]

sum+=z

}

1. Print sum
2. Stop.

**Code:**

#include<iostream>

using namespace std;

int main(){

int n;

cout<<"Enter the number of known variables: ";

cin >> n;

static float mat[10][2] = {0.0};

for (int i = 0; i < n; i++)

{

/\* code \*/

printf("Enter x%d: ", i + 1);

cin >> mat[i][0];

printf("Enter y%d: ", i + 1);

cin >> mat[i][1];

}

cout<<endl<<endl;

// printing the table

cout << "x" << '\t' << "y" << endl<< endl;

for (int i = 0; i < n; i++)

{

/\* code \*/

cout << mat[i][0] << '\t' << mat[i][1] << endl;

}

float x;

cout << "Enter the value of x at which you want to calculate the value of y: ";

scanf(" %f", &x);

// applying the Lagrange's Interpolation Formula

float sum =0.0;

for (int i = 0; i < n; i++)

{

float z= 1.0;

// cout<<z<<endl;

/\* code \*/

for (int j = 0; j < n; j++)

{

/\* code \*/

if (i!=j)

{

/\* code \*/

z \*= (x - mat[j][0]); // --------> x- x[j]

z /= (mat[i][0] - mat[j][0]); // --------> x[i]- x[j]

// cout << z << '\t' << sum << endl;

}

}

z\*=mat[i][1]; // --------> y[i]

sum+=z;

}

printf("Value of y at x=%f is: %f\n\n", x, sum);

return 0;

}

**Output:**

Windows PowerShell

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PS E:\03 Semester\CBNST\Unit 03> cd "e:\03 Semester\CBNST\Unit 03\" ; if ($?) { g++ 13\_lagrangesInterpolationFormula.cpp -o 13\_lagrangesInterpolationFormula } ; if ($?) { .\13\_lagrangesInterpolationFormula }

Enter the number of known variables: 4

Enter x1: 1

Enter y1: 1

Enter x2: 2

Enter y2: 5

Enter x3: 7

Enter y3: 5

Enter x4: 8

Enter y4: 4

x y

1 1

2 5

7 5

8 4

Enter the value of x at which you want to calculate the value of y: 6

Value of y at x=6.000000 is: 6.238095