

Program -2a

Divyashree h b

Source Code:

```
#include<iostream>
#include<vector>
#include <math.h>//exp
#include<iomanip>//precision

using namespace std;

double fun_x(double x) {
    cout << fixed;
    std::setprecision(6);

    return exp(x*x);
}

int main() {
    cout << "Divyashree H B" << endl;
    cout << "Newtons differential difference" << endl;
    int mov=1;//exit
    double x, y;//intervals
    char testf;//testcase for N and Y
    int datapt;
    while (mov==1)
    {
        cout << "Enter N to give functional values else enter Y" << endl;
        cin >> testf;
        cout << "Enter the intervals " << endl;
        cin >> x >> y;
        //cout << x << y<<endl;
        cout << "Enter the number of data points" << endl;

        cin >> datapt;

        //calculate data point values and save in fun array i.e x value array
        vector<double> fun(datapt);
        cout <<fixed;
        std::setprecision(6);
        double tempsu= (y - x) / (datapt-1);
        fun[0]=(x);
        for (int i = 1; i <datapt; i++)
        {
            fun[i] = fun[i - 1] + tempsu;
            //cout << fun[i] << endl;
        }
        //cout <<"datapoint"<< fun[0] << endl;
        vector<vector< double>> funval(datapt,vector<double>(datapt)); //f(x) value
array
        if (testf == 'N' || testf == 'n')
        {
            cout << "Enter the values : " << endl;
            double tempin;
            for (int i = 0; i <datapt; i++)
            {
```

```

        cin >> tempin;
        funval[i][0]=( tempin);
    }
}
else
{
    double temp;
    for (int i = 0; i < datapt; i++)
    {
        temp = fun_x(fun[i]);
        //cout << "y0\t" << temp<<endl;
        funval[i][0] = temp;
    }

}
// fun vector holds all data points in the given interval
//funval[i][0] in i all the initial f(x) or functional values are found
//starting with iteration

for (int i = 1; i < datapt;i++) {
    for (int j = 0; j < (datapt - i); j++) {
        //cout << i << " " << j << " " << funval[i - 1][j + 1] << " "
<< funval[i - 1][j] << " " << endl;
        funval[j][i] = ((funval[j+ 1][i - 1] ) - (funval[j][i-1])) /
(fun[j + i] - fun[j]);
    }//for (int i = 0; i < tempfun.size(); i++)cout << tempfun[i] <<
"tempfun" << endl;

}
cout << "Differantial Table :" << endl;
//// printing the elements
for (int i = 0; i<datapt; i++)
{
    cout << fun[i] << " ";
    for (int j = 0; j < (datapt - i); j++) {
        cout << funval[i][j] << " ";
    }
    cout << endl;
}
double X;
cout<<"\n"<< "Enter the value of X:" << endl;
cin >> X;
//calculating P(X) for a given X
//double prod_x=1;//(x-xi)
double sumval=funval[0][funval[0].size()-1];//p(x)
for (int i = funval[0].size()-2;i>=0; i--)
{
    sumval = funval[0][i] + (X-fun[i])*sumval;
}

cout << "P("<<X<<")    =    " << sumval<<endl;
//condition to quiet
cout << endl;
cout << "To continue enter 1 else enter 0" << endl;
cin >> mov;
}

return 0;}

```

Screen shot:

```
C:\Users\divya\OneDrive\documents\visual studio 2015\Projects\2a\Debug\2a.exe
Divyashree H B
Newtons differential difference
Enter N to give functional values else enter Y
Y
Enter the intervals
-1 1
Enter the number of data points
11
Differential Table :
-1.000000 2.718282 -4.109005 4.483119 -3.235762 2.059950 -0.992623 0.479443 -0.162676 0.075063 -0.012136 0.012136
-0.800000 1.896481 -2.315757 2.541662 -1.587802 1.067327 -0.417292 0.251697 -0.042575 0.053219 0.012136
-0.600000 1.433329 -1.299093 1.588981 -0.733940 0.650035 -0.115255 0.192092 0.042575 0.075063
-0.400000 1.173511 -0.663500 1.148617 -0.213912 0.534780 0.115255 0.251697 0.162676
-0.200000 1.040811 -0.204054 1.020269 0.213912 0.650035 0.417292 0.479443
-0.000000 1.000000 0.204054 1.148617 0.733940 1.067327 0.992623
0.200000 1.040811 0.663500 1.588981 1.587802 2.059950
0.400000 1.173511 1.299093 2.541662 3.235762
0.600000 1.433329 2.315757 4.483119
0.800000 1.896481 4.109005
1.000000 2.718282

Enter the value of X:
-0.4
P(-0.400000) = 1.173511

To continue enter 1 else enter 0
1
Enter N to give functional values else enter Y
n
Enter the intervals
0 1.1
Enter the number of data points
6
Enter the values :
-6.0
-5.89483
-5.65014
-5.17788
-4.28172
-3.99583
Differential Table :
0.000000 -6.000000 0.478045 1.441322 1.378193 1.925956 -21.647840
0.220000 -5.894830 1.112227 2.350930 3.073034 -21.886668
0.440000 -5.650140 2.146636 4.379132 -16.187234
```

C:\Users\divya\OneDrive\documents\visual studio 2015\Projects\2a\Debug\2a.exe

```
0.400000  1.173511  1.299093  2.541662  3.235762
0.600000  1.433329  2.315757  4.483119
0.800000  1.896481  4.109005
1.000000  2.718282
```

Enter the value of X:

-0.4

$P(-0.400000) = 1.173511$

To continue enter 1 else enter 0

1

Enter N to give functional values else enter Y

n

Enter the intervals

0 1.1

Enter the number of data points

6

Enter the values :

-6.0

-5.89483

-5.65014

-5.17788

-4.28172

-3.99583

Differantial Table :

```
0.000000  -6.000000  0.478045  1.441322  1.378193  1.925956  -21.647840
```

```
0.220000  -5.894830  1.112227  2.350930  3.073034  -21.886668
```

```
0.440000  -5.650140  2.146636  4.379132  -16.187234
```

```
0.660000  -5.177880  4.073455  -6.304442
```

```
0.880000  -4.281720  1.299500
```

```
1.100000  -3.995830
```

Enter the value of X:

0.34

$P(0.340000) = -5.766505$

To continue enter 1 else enter 0