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**Assignment**

**Course Name: Numerical Method Sessional**

**Course Code: CSE-3608**

**Submitted To.**

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**//11**

*//11*

#include <iostream>

using namespace std;

double x[50],y[50][50];

void forward\_difference(int n,double y[][50])

{

for(int i=1;i<n;i++)

{

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

{

y[j][i]=y[j+1][i-1]-y[j][i-1];

}

}

}

void print(int n)

{

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

{

cout<<x[i];

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

{

cout<<"\t"<<y[i][j];

}

cout<<endl;

}

}

int main()

{

int n;

cout<<"Size of data?\n";

cin>>n;

cout<<"Enter those\n";

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

{

cin>>x[i]>>y[i][0];

}

forward\_difference(n,y);

print(n);

}

Input :

Size of data?

5

Enter those

1 1

2 8

3 27

4 64

5 125

Output:

1 1 7 12 6 0

2 8 19 18 6

3 27 37 24

4 64 61

5 125

//12

#include<iostream>

using namespace std;

double x[50],y[50][50],sum;

void forward\_difference(int n,double y[][50])

{

for(int i=1;i<n;i++)

{

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

{

y[j][i]=y[j+1][i-1]-y[j][i-1];

}

}

}

long long int fac(int n)

{

int fa=1;

for(int i=2;i<=n;i++)

fa\*=i;

return fa;

}

double uval(int n,double u)

{

double t=u;

for(int i=1;i<n;i++)

t\*=(u+i);

return t;

}

void f\_interpolation(int n,int val)

{

sum=y[0][0];

double u=(val-x[0])/(x[1]-x[0]);

for (int i=1;i<n;i++) {

sum+=(uval(i,u)\*y[0][i])/fac(i);

}

}

int main()

{

int n,value;

cout<<"How many number?"<<endl;

cin>>n;

cout<<"Enter the value"<<endl;

cin>>value;

cout<<"enter those"<<endl;

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

{

cin>>x[i]>>y[i][0];

}

forward\_difference(n,y);

f\_interpolation(n,value);

cout<<"value at "<<value<<"is "<<sum<<endl;

}

Input:

How many number?

5

Enter the value

144

enter those

140 3.685

150 4.84

160 6.302

170 8.076

180 10.225

Output:

value at 144 is 4.24512

//13

*//13*

#include<iostream>

using namespace std;

double x[50],y[50][50],sum;

void backward\_difference(int n,double y[][50])

{

for(int i=1;i<n;i++)

{

for(int j=n-1;j>=i;j--)

{

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

}

}

}

int fac(int n)

{

int fa=1;

for(int i=2;i<=n;i++)

fa\*=i;

return fa;

}

double uval(int n,double u)

{

double t=u;

for(int i=1;i<n;i++)

t\*=(u+i);

return t;

}

void b\_interpolation(int n,int val)

{

sum=y[n-1][0];

double u=(val-x[n-1])/(x[1]-x[0]);

for (int i=1;i<n;i++) {

sum+=((uval(i,u)\*y[n-1][i])/fac(i));

}

}

int main()

{

int n,value;

cout<<"How many number?"<<endl;

cin>>n;

cout<<"Enter the value"<<endl;

cin>>value;

cout<<"enter those"<<endl;

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

{

cin>>x[i]>>y[i][0];

}

backward\_difference(n,y);

b\_interpolation(n,value);

cout<<"value at "<<value<<" is "<<sum<<endl;

}

Input:

How many number?

6

Enter the value

2006

enter those

1961 20

1971 27

1981 39

1991 52

2001 70

2011 90

Output:

value at 2006 is 80.6211

//14

*//14*

#include<iostream>

using namespace std;

double x[100],fy[100];

void lag\_inv(int n,double x[],double y[],double v)

{

double val,y1=0;

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

{

val=1;

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

{

if(i!=j)

{

val\*=(v-x[j])/(x[i]-x[j]);

}

}

y1+=val\*fy[i];

*//val+=x[i]\*((v-fy))*

}

cout<<"value will be "<<y1<<endl;

}

int main()

{

int n;

double po;

cout<<"numbers?\n";

cin>>n;

cout<<"data..?\n";

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

{

cin>>x[i]>>fy[i];

}

cout<<"point?\n";

cin>>po;

lag\_inv(n,x,fy,po);

}

Input:

numbers?

4

data..?

12 5

13 6

14 9

16 11

point?

13.5

Output:

value will be 7.40625

//15

*//15*

#include <iostream>

using namespace std;

double x[50],y[50][50];

double term(int i,double val,double x[])

{

double t=1;

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

t\*=(val-x[j]);

return t;

}

double cal(int n,double val,double x[], double y[][50])

{

double sum=y[0][0];

for(int i=1;i<n;i++){

sum+=(term(i,val,x)\*y[0][i]);

}

return sum;

}

void diff\_tab(int n,double x[],double y[][50])

{

for(int i=1;i<n;i++)

{

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

{

y[j][i]=(y[j][i-1]-y[j+1][i-1])/(x[j]-x[i+j]);

}

}

}

int main()

{

int n;

double v;

cout<<"how many numbers?\n";

cin>>n;

cout<<"values\n";

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

cin>>x[i]>>y[i][0];}

cout<<"desired val?\n";

cin>>v;

diff\_tab(n,x,y);

cout<<"value at "<<v<<" is "<<cal(n,v,x,y)<<endl;

}

Input:

how many numbers?

5

values

1 0

3 18

4 58

6 190

10 920

desired val?

2.7

Output:

value at 2.7 is 9.35463