**PROGRAM 9: Simpson’s 1/3 rule**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

#include<math.h>

float func(float x)

{

return 1 / ( 1 + x \* x );

}

void main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n,i;

float a,b,h,result,evensum=0,oddsum=0;

printf("Enter the lower limit: ");

scanf("%f",&a);

printf("Enter the upper limit: ");

scanf("%f",&b);

printf("Enter the interval: ");

scanf(" %d",&n);

float x[n],y[n];

h=(b-a)/(float)n;

x[0]=a;

y[0]=func(a);

x[n]=b;

y[n]=func(b);

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

{

x[i]=x[0]+i\*h;

y[i]=func(x[i]);

}

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

{

if(i%2==0)

evensum+=y[i];

else

oddsum+=y[i];

}

result=h/3\*((y[0]+y[n])+4\*oddsum+2\*evensum);

printf("Result: %lf",result);

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the lower limit: 1

Enter the upper limit: 10

Enter the interval: 10

Result: 0.687825

**PROGRAM 10:Simpson’s 3/8 rule**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

#include<math.h>

float func(float x)

{

return 1 / ( 1 + x \* x );

}

void main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n,i;

float a,b,h,result,sum=0,sum1=0;

printf("Enter the lower limit: ");

scanf("%f",&a);

printf("Enter the upper limit: ");

scanf("%f",&b);

printf("Enter the interval: ");

scanf("%d",&n);

float x[n],y[n];

h=(b-a)/(float)n;

x[0]=a;

y[0]=func(a);

x[n]=b;

y[n]=func(b);

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

{

x[i]=x[0]+i\*h;

y[i]=func(x[i]);

}

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

{

if(i%3==0)

sum+=y[i];

else

sum1+=y[i];

}

result=3\*h/8\*((y[0]+y[n])+3\*sum1+2\*sum);

printf("Result: %lf",result);

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the lower limit: 1

Enter the upper limit: 10

Enter the interval: 10

Result: 0.687927

**PROGRAM 11: Trapezoidal method:**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

#include<math.h>

float func(float x)

{

return 1/(1+x\*x);

}

void main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n,i;

float a,b,h,result,sum=0;

printf("Enter the lower limit: ");

scanf("%f",&a);

printf("Enter the upper limit: ");

scanf("%f",&b);

printf("Enter the interval: ");

scanf("%d",&n);

float x[n],y[n];

h=(b-a)/(float)n;

x[0]=a;

y[0]=func(a);

x[n]=b;

y[n]=func(b);

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

{

x[i]=x[0]+i\*h;

y[i]=func(x[i]);

}

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

{

sum+=y[i];

}

result=h/2\*((y[0]+y[n])+2\*sum);

printf("Result: %lf",result);

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the lower limit: 0

Enter the upper limit: 1

Enter the interval: 6

Result: 0.784241

**PROGRAM 12: Langrange’s Interpolation**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n;

printf("Enter the number of terms: ");

scanf("%d",&n);

int x[100],y[100];

printf("Enter matrix x: ");

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

scanf("%d",&x[i]);

printf("Enter matrix y: ");

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

scanf("%d",&y[i]);

int a;

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

scanf("%d",&a);

float b=0,res,div;

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

{

res=1.0;

div=1.0;

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

{

if(i!=j)

{

res\*=a-x[j];

div\*=x[i]-x[j];

}

}

b+=((res/div)\*y[i]);

}

printf("Result: 0.2f",b);

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the number of terms: 4

Enter matrix x: 0 1 2 5

Enter matrix y: 2 3 12 147

Enter the value of x: 3

Result: 35.00

**PROGRAM 13: Euler’s Method**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

float func(float x,float y)

{

return x+y;

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

float x0, y0, xn, h, yn, val;

int i, n;

printf("Enter Initial Condition\n");

printf("x0 = ");

scanf("%f", &x0);

printf("y0 = ");

scanf("%f", &y0);

printf("Enter calculation point xn = ");

scanf("%f", &xn);

printf("Enter number of steps: ");

scanf("%d", &n);

h = (xn-x0)/n;

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

{

val = func(x0, y0);

yn = y0 + h \* val;

y0 = yn;

x0 = x0+h;

}

printf("\nValue of y at x = %0.2f is %0.3f",xn, yn);

return 0;

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter Initial Condition

x0 = 0

y0 = 1

Enter calculation point xn = 1

Enter number of steps: 10

Value of y at x = 1.00 is 3.187

**PROGRAM 14: Runge Kutta Method 4th order**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

float func(float x,float y)

{

return (y\*y-x\*x)/(y\*y+x\*x);

}

int main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

float x0, y0, xn, h, yn, k1, k2, k3, k4, k;

int i, n;

printf("Enter Initial Condition\n");

printf("x0 = ");

scanf("%f", &x0);

printf("y0 = ");

scanf("%f", &y0);

printf("Enter calculation point xn = ");

scanf("%f", &xn);

printf("Enter number of steps: ");

scanf("%d", &n);

h = (xn-x0)/n;

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

{

k1 = h \* (func(x0, y0));

k2 = h \* (func((x0+h/2), (y0+k1/2)));

k3 = h \* (func((x0+h/2), (y0+k2/2)));

k4 = h \* (func((x0+h), (y0+k3)));

k = (k1+2\*k2+2\*k3+k4)/6;

yn = y0 + k;

x0 = x0+h;

y0 = yn;

}

printf("\nValue of y at x = %0.2f is %0.3f",xn, yn);

return 0;

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter Initial Condition

x0 = 0

y0 = 1

Enter calculation point xn = 0.4

Enter number of steps: 2

Value of y at x = 0.40 is 1.375

**PROGRAM 7: Newton Forward Interpolation**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

#include<math.h>

int fact(int);

void main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

float arr[10][11],x,h,p,y,px=1;

int i,j,n;

printf("\nEnter the number of data:");

scanf("%d",&n);

printf("\nEnter the data:\n");

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

{

printf("X%d=",i);

scanf("%f",&arr[i][0]);

printf("Y%d=",i);

scanf("%f",&arr[i][1]);

}

for(j=2;j<=n;j++)

for(i=0;i<n-1;i++)

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

printf("\nDifference table is:-");

printf("\n\tX\tY");

for(i=0;i<=n-2;i++)

printf("\t^%dY\t",i+1);

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

{

printf("\n");

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

{

printf("\t%.2f",arr[i][j]);

}

}

printf("\nEnter the value x for function f(x):");

scanf("%f",&x);

h=arr[1][0]-arr[0][0];

p=(x-arr[0][0])/h;

y=arr[0][1];

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

{

px=px\*(p-(i-1));

y=y+(arr[0][i+1]\*px)/fact(i);

}

printf("\nThe value of function at x=%f is %f",x,y);

}

int fact(int n)

{

int i,f=1;

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

f=f\*i;

return f;

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the number of data:5

Enter the data:

X0=40

Y0=31

X1=50

Y1=73

X2=60

Y2=124

X3=70

Y3=159

X4=80

Y4=190

Difference table is:-

X Y ^1Y ^2Y ^3Y ^4Y

40.00 31.00 42.00 9.00 - 25.00 37.00

50.00 73.00 51.00 -16.00 12.00

60.00 124.00 35.00 -4.00

70.00 159.00 31.00

80.00 190.00

Enter the value x for function f(x):45

The value of function at x=45.000000 is 47.867188

**PROGRAM 8: Newton Backward Interpolation**

**/\*Name-CHINMAY RAJ SHAH**

**Section-H**

**Roll number- 50**

**University Roll number- 2016711\*/**

#include<stdio.h>

int fact(int);

void main()

{

printf(“Name: CHINMAY RAJ SHAH\n Section: H\n Class roll number: 50\n University roll number: 2016711\n ”);

int n,i,j;

float arr[10][11],px=1,x,y,p,h;

printf("\nEnter the no of data:");

scanf("%d",&n);

printf("\nEnter the data:");

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

{

printf("\nX%d=",i);

scanf("%f",&arr[i][0]);

printf("\nY%d=",i);

scanf("%f",&arr[i][1]);

}

for(j=2;j<=n;j++)

{

for(i=0;i<n-1;i++)

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

}

printf("\nThe difference table");

printf("\n\tX \tY");

for(i=0;i<n-1;i++)

printf("\t ^%d",i+1);

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

{

printf("\n");

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

printf("\t%.2f",arr[i][j]);

}

printf("\nEnter the value of x for f(x): ");

scanf("%f",&x);

h=arr[n-1][0]-arr[n-2][0];

p=(x-arr[n-1][0])/h;

y=arr[n-1][1];

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

{

px=px\*(p+(i-1));

y=y+(arr[n-1-i][i+1]\*px)/fact(i);

}

printf("\nthe value of f(x) at x=%f is %f",x,y);

}

int fact(int n)

{

int f=1,i;

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

f=f\*i;

return f;

}

**OUTPUT:**

Name-CHINMAY RAJ SHAH

Section-H

Roll number- 50

University Roll number- 2016711

Enter the no of data:5

Enter the data:

X0=1891

Y0=46

X1=1901

Y1=66

X2=1911

Y2=81

X3=1921

Y3=93

X4=1931

Y4=101

The difference table

X Y ^1 ^2 ^3^4

1891.00 46.00 20.00 -5.00 2.00 -3.00

1901.00 66.00 15.00 -3.00 -1.00

1911.00 81.00 12.00 -4.00

1921.00 93.00 8.00

1931.00 101.00

Enter the value of x for f(x): 1925

the value of f(x) at x=1925.000000 is 96.836800