# Statistics and Numerical Analysis lab
# Code: MM 391
# Contact: 4P
# Credit: 3

## 1. Newton's forward Interpolation

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    int n,i,j;
    float m,x[20],y[20],h,u,s,p=1,f[30][30];
    clrscr();
    printf("\nenter n(no. of (data-1))");
    scanf("%d",&n);
    printf("\n\n\nenter the value of x1,x2,x3,....,xn");
    for(i=0;i<=n;i++)
    {
     scanf("%f",&x[i]);
    }
    printf("\n\n\nenter the value of y1,y2,y3,.....,yn");
    for(i=0;i<=n;i++)
    {
     scanf("%f",&y[i]);
    }
    h=x[1]-x[0];
    printf("\n\nenter the interpolating pt. x");
    scanf("%f",&m);
    u=(m-x[0])/h;
    s=y[0];
    for(j=0;j<=n;j++)
    {
    f[0][j]=y[j];
    }
    for(i=1;i<=n;i++);
    {
     for(j=0;j<=n-i;j++)
     {
      f[i][j]=f[i-1][j+1]-f[i-1][j];
```

```
        }
        }
        for(i=1;i<=n;i++)
        {
          p=(p*(u-i+1))/i;
          s=s+p*f[i][0];
        }
        printf("\n\n\tf(%6.4f)=%6.4f",m,s);
        getch();
    }
```

**2. Newton's Backward** Interpolation:

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
        int n,i,j;
        float u, x, xn, h, sum=0, p=1, y[10][10];
        clrscr();
        printf("\n enter n, x, xn, h");
        scanf("%d%f%f%f",&n,&x,&xn,&h);
        printf("\n enter the value of y");
        for(i=0;i<=n-1;i++)
        scanf("%f", &y[0][i]);
        for(i=1;i<=n-1;i++)
        {
         for(j=1;j<n;j++)
         y[i][j]=y[i-1][j]-y[i-1][j-1];
        }
        u=(x-xn)/h;
        for(i=1;i<=n-1;i++)
        {
        p=p*((u+i-1)/i);
                sum=sum+(p*y[i][n-1]);
                }
        sum=sum+y[0][n-1];
        printf("%f",sum);
        getch();
  }
```

3. Lagrange's Interpolation:

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    clrscr();
    int i,j,n;
    float x[30],y[30],sum,xp,a,b;
    printf("\n LAGRANGE METHOD");
    printf("\n Enter the value of n:");
    scanf("%d",&n);
    for(i=0;i<n;i++)
    {
    printf("\n Enter the values of x%d",i);
    scanf("%f",&x[i]);
    }
    for(i=0;i<n;i++)
    {
    printf("\nEnter the values of y%d ",i);
    scanf("%f",&y[i]);
    }
    printf("\nENTER THE VALUE OF INTERPOLATING POINT Xp ");
            scanf("%f",&xp);
            sum=0;
    for(i=0;i<n;i++)
    {
    a=1;
    b=1;
            for(j=0;j<n;j++)
            {
                    if(i!=j)
                    {
                    a=a*(xp-x[j]);
                    b=b*(x[i]-x[j]);
                    }
            }
            sum=sum+((a/b)*y[i]);
     }
     printf("THE VALUE OF f(x) is = %f",sum);
     getch();
     }
```

## 4. Newton Raphson Method

Question: **Write a c-program to find a real root of** $x^2 + x - 1 = 0$ **by N-R Method, correct up to 5 places of decimal.**

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
  float x0,xnew,eps;
        clrscr();
        printf("enter the value of x0 and eps\n");
        scanf("%f%f",&x0,&eps);
        xnew=x0-(x0*x0+x0-1)/(2*x0+1);
        while(fabs(xnew-x0)>eps)
        {
        x0=xnew;
        xnew=x0-(x0*x0+x0-1)/(2*x0+1);
        }
        printf("the required value is=%f",xnew);
        getch();
        }
```

## 5. Regula Falsi Method

Question: **Write a c-program to find a real root of** $x^2 + x - 1 = 0$ **by R-F Method, correct up to 5 places of decimal.**

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
#define f(x) (x*x+x-1)
void main()
{  int i,n;
```

```
        float a,b, x[100], eps;
        clrscr();
        printf("enter the value of n and eps\n");
        scanf("%d%f",&n,&eps);
a=0;
b=a+1;
if (f(a)*f(b)>0)
{
a=b;
b=a+1;
}
else
x[0]=a;
x[1]=b;
for(i=1;i<=n;i++)
{
x[i+1]=x[i]-((x[i]-x[i-1])*f(x[i]))/(f(x[i])-f(x[i-1]));
if (fabs(x[i+1]-x[i])<eps)
goto S1;
}
S1:
printf("/n the required value is=%f", x[i-1]);
        getch();
        }
```

## 1. Bisection and Secant Method

Question: **Write a c-program to find a real root (lying between 2 and 3) of** $x^3 - 9x + 1 = 0$ **by Bisection Method, correct up to 5 places of decimal. (Ans: 2.942)**

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
#define f(x) (x*x*x-9*x+1)
void main()
{  int n=1;
        float a,b, x,y1,y2,y3;
        clrscr();
        printf("enter the interval (a,b) \n");
        scanf("%f%f",&a,&b);
        y1=f(a);
        y2=f(b);
        if(y1*y2>0) goto s1;
        s2:
        x=(a+b)/2;
```

```
        y3=f(x);
        if(y1*y3<0)
        b=x;
        else
        a=x;
        n=n+1;
        if(fabs(a-b)>.00001) goto s2;
        printf("The required root is =%f",x);
s1:
        getch();
        }
```