BM

```
#include<bits/stdc++.h>
#define f(x) x*x*x - 2*x -5
using namespace std;
int main()
{
   float x0=0,x1,x2,e=0.0001,tmp;
   int iteration=0;
   do
   {
      cout<<"Enter initial guesses: ";
      cin>>x1>>x2;
      if(f(x1)*f(x2)>=0)
      {
         cout<<"\nInvalid guesses....";
      }
   }while(f(x1)*f(x2)>0);
   do
   {
      iteration++;
      tmp=x0;
      x0=(x1+x2)/2;
      if(f(x0)==0.0)
      {
         cout<<"\nRoot = "<<x0;
         break;
      }
      else if(f(x0)*f(x1)<0)
      {
         cout<<"\nRoot = "<<x0;
         x2=x0;
      }
      else
      {
         cout<<"\nRoot = "<<x0;
         x1=x0;
      }
      cout<<"\t Iteration = "<<iteration;
   }while(fabs(tmp-x0)>e);
   cout<<"\n\nAppropriate root is: "<< static_cast<int>(round(x0));
   return 0;
}
```

FPM

```
#include <bits/stdc++.h>
using namespace std;
#define f(x) (x*x - x - 2) // Removed semicolon at the end of macro definition
int main()
{
   float x0 = 0, x1, x2, tmp, e = 0.00001;
   int iteration = 0;
   do
   {
      cout << "Enter initial guesses: ";
      cin >> x1 >> x2;
      if (f(x1) * f(x2) >= 0)
      {
         cout << "\nInvalid guesses....";
         return 1;
      }
   }
   while (f(x1) * f(x2) > 0);
   do
   {
      iteration++;
      tmp = x0;
      x0 = (x2 * f(x1) - x1 * f(x2)) / (f(x1) - f(x2));
      if (f(x0) == 0)
      {
         cout << "\nRoot = " << x0;
         break;
      }
      else if (f(x0) * f(x1) < 0)
      {
         cout << "\nRoot = " << x0;
         x2 = x0;
      }
      else
      {
         cout << "\nRoot = " << x0;
         x1 = x0;
      }
   }
   while (fabs(tmp - x0) > e);   // Used fabs function to compare floating-point numbers
   cout << "\nThe approximate root is : " << x0;
   return 0;
}
```

NRM

```
#include<bits/stdc++.h>
using namespace std;
#define f(x) x*x - 3*x +2
#define g(x) 2*x - 3
int main()
{
   float x0,x1,g0,f0,f1,e=0.00001;
   int iteration=1,n;
   cout<<"Enter initial guess: ";
   cin>>x0;
   cout<<"Enter maximum number of iteration: ";
   cin>>n;
   do
   {
      g0=g(x0);
      f0=f(x0);
      if(g0==0.0)
      {
         cout<<"\nMathematical error...";
         exit(0);
      }
      x1=x0-(f0/g0);
      cout<<"\nIteration: "<<iteration<<"\tRoot = "<<x1;
      x0=x1;
      iteration++;
      if(iteration>n)
      {
         cout<<"\nNot convergent...";
         exit(0);
      }
      f1=f(x1);
   }while(fabs(f1)>e);
   cout<<"\n\nThe approximate root is: "<<static_cast<int>(round(x1));
   return 0;
}
```

SM

```
#include<bits/stdc++.h>
using namespace std;
#define f(x) x*x-4*x-10
int main()
{
   float x1,x2,x3,f1,f2,f3,e=0.00001;
   int iteration=1,n;
   cout<<"Enter initial guesses: ";
   cin>>x1>>x2;
   cout<<"Enter the maximum number of iteration: ";
   cin>>n;
   do
   {
      f1=f(x1);
      f2=f(x2);
      if(f1==f2)
      {
         cout<<"Mathematical error....";
         exit(0);
      }
      x3=x2-(f2*(x2-x1))/(f2-f1);
      f3=f(x3);
      cout<<"\nIteration-"<<iteration<<"\tRoot="<<x3;
      x1=x2;
      x2=x3;
      f1=f2;
      f2=f3;
      iteration++;
      if(iteration>n)
      {
         cout<<"\nNot convergent..";
         exit(0);
      }
   }
   while(fabs(f3)>e);
   cout<<"\n\nThe approximate root is : "<<static_cast<int>(round(x3));
   return 0;
}
```

GEM

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
   float a[10][10],x[10],r;
   int i,j,k,n;
   cout<<"Enter the no. of matrix: ";
   cin>>n;
   cout<<"Enter the elements of augmented matrix: \n";
   for(i=1;i<=n;i++)
   {
      for(j=1;j<=(n+1);j++)
      {
         cout<<"A["<<i<<"]["<<j<<"]= ";
         cin>>a[i][j];
      }
   }
   for(j=1;j<=n;j++)
   {
      for(i=1;i<=n;i++)
      {
         if(i!=j)
         {
            r=a[i][j]/a[j][j];
            for(k=1;k<=(n+1);k++)
            {
               a[i][k]=a[i][k]-r*a[j][k];
            }
         }
      }
   }
   cout<<"\nThe result is : \n";
   for(i=1;i<=n;i++)
   {
      x[i]=a[i][n+1]/a[i][i];
      cout<<"\nx"<<i<<" = "<<x[i];
   }
   return 0;
}
```

GJM(Jacobi)

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
   const int n=3;
   float a[n][n]={{2, 1, 1},{3, 5, 2},{2, 1, 4}};
   float b[n]={5,15,8};
   float x[n]={0,0,0};
   float y[n];
   int i=0,j=0,m=0;
   cout<<setprecision(6)<<fixed;
   cout<<"Enter the no. of iterations: ";
   cin>>m;
   while(m--)
   {
      for(i=0;i<n;i++)
      {
         y[i]=b[i]/a[i][i];
         for(j=0;j<n;j++)
         {
            if(j!=i)
            y[i]=y[i]-(a[i][j]/a[i][i]*x[j]);
         }
      }
      for(i=0;i<n;i++)
      {
         x[i]=y[i];
         cout<<"x"<<i+1<<"= "<<y[i]<<"\t\t";
      }
      cout<<"\n";
   }
   cout<<"\nApproximate solution is: ";
   for(i=0;i<n;i++)
   {
      cout<<"\nx"<<i+1<<"= "<<static_cast<int>(round(x[i]));
   }
   return 0;
}
```

GSM

```
#include<bits/stdc++.h>
using namespace std;
int main()
{
   const int n=3;
   float a[n][n]= {{2,-1,0},{-1,2,-1},{0,-1,2}};
   float b[n]= {7,1,1};
   float x[n]= {0,0,0};
   float y[n];
   int i=0,j=0,m=0;
   cout<<"Enter the no. of iterations: ";
   cin>>m;
   while(m>0)
   {
      for(i=0; i<n; i++)
      {
         y[i]=(b[i]/a[i][i]);
         for(j=0; j<n; j++)
         {
            if(j==i)
               continue;
            y[i]=y[i]-(a[i][j]/a[i][i]*x[j]);
            x[i]=y[i];
         }
         cout<<"x"<<i+1<<"="<<y[i]<<"\t";
      }
      cout<<"\n";
      m--;
   }
   cout<<"\nApproximate solution is: ";
   for(i=0; i<n; i++)
   {
      cout<<"\nx"<<i+1<<"= "<<static_cast<int>(round(x[i]));
   }
   return 0;
}
```