Aim: To find the root of an equation using Newton-Raphson Method.

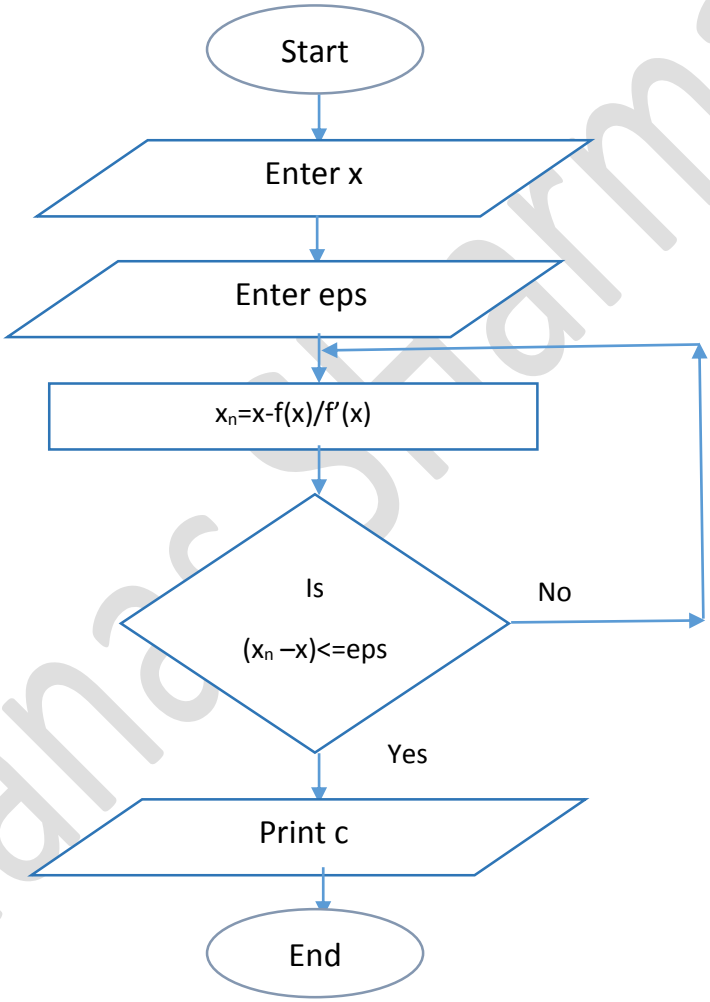
Algorithm:

1. Enter the initial guess, x
2. Enter the desired accuracy, eps.
3. Repeat

   x_n=x-f(x)/f'(x)

   Until x_n –x<=eps
4. Print 'c', which is the root.

Flow Chart:



Program:

```
//Newton-Raphson Method
#include<iostream>
#include<cmath>
#include<iomanip>
using namespace std;
double f(double x);    //declare the function for the given equation
double f(double x)    //define the function here, ie give the equation
{
   double a=3.0*x+sin(x)-pow(2.71828,x);    //write the equation whose roots are to be determined
   return a;
}
double fprime(double x);
double fprime(double x)
{
   double b=3.0+cos(x)-pow(2.71828,x);        //write the first derivative of the equation
   return b;
}
int main()
{
   double x,x1,e,fx,fx1;
   cout.precision(4);        //set the precision
   cout.setf(ios::fixed);
   cout<<"Enter the initial guess\n";    //take an intial guess
   cin>>x1;
   cout<<"Enter desired accuracy\n";    //take the desired accuracy
   cin>>e;
   fx=f(x);
   fx1=fprime(x);
   int iter=1;
   cout <<"iter"<<setw(8)<<"x{i}"<<setw(19)<<"x{i+1}"<<setw(19)<<"|x{i+1}-x{i}|"<<endl;
   cout<<"-------------------------------------------------------------\n";    //to make a line on the screen for
formatted and clean output

   do
   {
      x=x1;                /*make x equal to the last calculated value of                    x1*/
      fx=f(x);            //simplifying f(x)to fx
      fx1=fprime(x);            //simplifying fprime(x) to fx1
      x1=x-(fx/fx1);            /*calculate x{1} from x, fx and fx1*/
      cout<<iter<<setw(12)<<x<<setw(16)<<x1<<setw(16)<<abs(x1-x)<<endl;
      iter++;
   }while (fabs(x1-x)>=e);            /*if |x{i+1}-x{i}| remains greater than the desired accuracy, continue
the loop*/
   cout<<"The root of the equation is "<<x1<<endl;
   return 0;
}
```

Output:

For f(x)=x^3-8

```
Enter the initial guess
3
Enter desired accuracy
.01
iter    x{i}            x{i+1}      |x{i+1}-x{i}|
-------------------------------------------------------
1       3.0000          2.2963          0.7037
2       2.2963          2.0366          0.2597
3       2.0366          2.0007          0.0359
4       2.0007          2.0000          0.0007
The root of the equation is 2.0000
```

For f(x)= 3x+sinx-e^x

```
Enter the initial guess
0
Enter desired accuracy
.001
iter    x{i}            x{i+1}      |x{i+1}-x{i}|
-------------------------------------------------------------
1       0.0000          0.3333          0.3333
2       0.3333          0.3602          0.0268
3       0.3602          0.3604          0.0003
The root of the equation is 0.3604
```