Q] Write down the code for finding a real root of ~~equivalent~~ the equation $x^3+x-1=0$ using Newton Raphson method with initial value 0.6 & 0.8

Solution

Newton Raphson code for $x^3+x-1=0$ implementing through c++ is given below:

```
# include <bits/stdc++.h>
 using namespace std
# define EPSILON 0.001

double func (double x)
{
    return x*x*x + x -1;
}
double derivFunc (double x)
{
    return ~~3*x*x +1~~ 3*x*x+1;
}
```

```
void newtonRaphson (double x)
{
    double h = func(x) / derivFunc(x);
    while (abs(h) >= EPSILON)
    {
        h = func(x)/derivFunc(x);
        x = x-h;
    }
    cout << "The value of the root
            is: " << x;
}

int main ()
{
    double x0 = -20;
    newton Raphson (x0);
    return 0;
}
```

Output: The value of the root is : 0.6823278

0.360421

Q) Use Newton-Raphson Method to find a real root of the equation $3x + \sin x = e^x$ correct up to 5 decimal places.

Solution:

Given equation,

$$3x + \sin x - e^x = 0$$

Let, $f(x) = 3x + \sin x - e^x$, $f'(x) = 3 + \cos x - e^x$

Now, $f(0.3) = -0.1543386$

and $f(0.5) = 0.330704267$

As, $f(0.3) \cdot f(0.5) < 0$, so, there exists at least one root between 0.3 & 0.5.

So, initial approximation value, $x_0 = \frac{0.3 + 0.5}{2}$

$= 0.4$

Applying Newton Raphson's method we get the following table:

Iteration	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$
1	0.35982538
2	0.360421576
3	0.360421703
4	0.360421703

From 2, 3 & 4 iteration, we get the approximation root correct up to 5 decimal placess of the given equation is = 0.36042