Newton – Raphson method

Find a root of the equation $3x^3 - 9x^2 + 8 = 0$ by Newton – Raphson method with 5 decimal point.

SOLUTION:

Given that, $f(x) = 3x^3 - 9x^2 + 8 = 0$ -----(1)

Let, x = 0; f(0) = 0 - 0 + 8 = +ve

x=1; f (1) = 3-9+8=2=+ve

x=2; f (2) = 24- 36+ 8=-4=-ve

Hence root lies between 1 and 2

Assume that, $x_n=1$; [when n=0]

Diff. with respect to x from equ(1) we get =>

 $f'(x) = 9x^2 - 18x$ ------(2)

We know from Newton-Raphson method =>

 $x_{n+1} = x_n - f(x)/f'(x)$

Steps	Xn	$x_{n+1} = x_n - f(x)/f'(x)$
1	1	$x_1 = 1 - 2/(-9) = 1.22222$
2	1.22222	$x_2 = 1.22222 - 0.032941/(-8.55556) = 1.22607$
3	1.22607	x ₃ =1.22607-0.000032/(-8.540031)= 1.22607

Since step 2 and 3 show the same value, Hence the real root is 1.22607 Ans:

Find a root of the equation $3x - \cos x - 1 = 0$ by Newton – Raphson method with 4 decimal point.

SOLUTION:

Given that, $f(x) = 3x - \cos x - 1 = 0$ -----(1)

Let, x = 0; $f(0) = 0 - \cos(57.3 \times 0) - 1 = -1 - 1 = -2 = -ve$

 $x=1; f(1) = 3 - \cos(57.3*1) - 1 = 1.2692 = +ve$

Hence root lies between 0 and 1

Assume that, $x_n=0$; [when n=0]

Diff. with respect to x from equ(1) we get =>

f '(x)= 3+sinx -----(2)

We know from Newton-Raphson method =>

 $x_{n+1} = x_n - f(x)/f'(x)$

Steps	Xn	$x_{n+1} = x_n - f(x)/f'(x)$
1	0	$x_1 = 0_{-1} (-2)/3 = 0.6667$
1	0	$\frac{1}{10} = 1000000000000000000000000000000000000$
2	0.0007	$X_2 = 0.0007 - 0.2142/3.018 = 0.0075$
3	0.6075	x ₃ =0.6075-0.001448/3.5708= 0.6071
4	0.6071	x ₄ =0.6071-0.000019/3.5705= 0.6071

Since step 3 and 4 show the same value, Hence the real root is 0.6071 Ans: