

Lab 2 –

Aim: Solution of non-linear equations by using Newton Raphson method

Brief Theory: The **Newton-Raphson method** (also known as **Newton's method**) is a way to quickly find a good approximation for the root of a real-valued function $f(x) = 0$. It uses the idea that a continuous and differentiable function can be approximated by a straight line tangent to it.

Numerical Procedure:

1. Start
2. Read x, e, n, d
 *x is the initial guess
 e is the absolute error i.e the desired degree of accuracy
 n is for operating loop
 d is for checking slope*
3. Do for i = 1 to n in step of 2
4. $f = f(x)$
5. $f1 = f'(x)$
6. If ($[f1] < d$), then display too small slope and go to 11.
 [] is used as modulus sign
7. $x1 = x - f/f1$
8. If ($[(x1 - x)/x1] < e$), the display the root as x1 and go to 11.
 [] is used as modulus sign
9. $x = x1$ and end loop
10. Display method does not converge due to oscillation.
11. Stop

Examples:

- i. Approximate the real root to four decimal places of

$$x^3 + 5x - 3 = 0$$

- ii. Approximate the only solution to the equation

$$x = \cos(x)$$

- iii. Find the real root of the equation

$$3x = \cos(x) + 1.$$