

Basic Concept

The Newton–Raphson Method is a numerical technique used to find the root of a nonlinear equation

$$F(x)=0$$

It uses the **first derivative** of the function and is based on the idea of approximating the function by a **tangent line** at a chosen point.

Formula

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Algorithm

1. Choose an initial approximation x_0 close to the actual root.
2. Evaluate $f(x_0)$ and $f'(x_0)$.
3. Compute the next approximation using:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

4. Check the stopping condition:

$$|x_{n+1} - x_n| < \text{tolerance}$$

5. Repeat the steps until the required accuracy is achieved.

Stopping Criteria

- Difference between successive approximations is less than tolerance
- Maximum number of iterations is reached