

Assignment#1

Bisection Method

(Binary Chopping of Half-interval)

- Evaluate a real root of the following equations by Bisection Method correct to four decimal places:
 - $x^3 - x - 1 = 0$
 - $x = \cos(x)$
 - $e^x = 4\sin(x)$
 - $f(x) = 3x - \sqrt{1 + \sin(x)}$
 - $\cos(x) = xe^x$
 - $e^x = 3x$
- Explain the **working principle** and a **pseudo-code** to find a real root of a non-linear equation using Bisection Method.

False Position Method

(Regula-falsi/Interpolation Method)

- Write an algorithm to find a real root of a non-linear equation using Interpolation Method.
- Using Regula-falsi method, compute the real root of the following equations correct to 3-decimal places:
 - $x \log_{10} x = 1.2$
 - $x \tan x = -1$
 - Fourth root of 32
 - $\sqrt[3]{3}$
 - $xe^x = \sin(x)$
 - $3x + \sin(x) = e^x$
- Locate the root of $f(x) = x^{10} - 1 = 0$, between 0 and 1.3 using **Bisection Method** and **Method of False Position**. Comment on which method is preferable.

Secant Method

- Explain the mechanism of finding a real root of a non-linear equation using Secant Method.
- Write a pseudo-code to find a real root of a non-linear equation using Secant Method.
- Find a root of the following equations correct up to 3 decimal places by the Secant Method:
 - $x - e^{-x} = 0$
 - $x^3 + x^2 + x + 7 = 0$
 - $x^5 - 3x^3 - 1 = 0$
 - $x \log_{10} x = 1.9$
- Evaluate $\sqrt{30}$ by Secant Method.

Fixed Point Iteration Method

(Iteration/Successive Approximation/Direct Substitution/Fixed Point Method)

- Use the iteration method to find a root of the following equations to four decimal places:
 - $2^x - x - 3 = 0$ which lies between -2 & -3
 - $2x = \cos(x) + 3$
 - $\cot(x) = x$

Newton-Raphson Method

- Derive Newton Raphson Iterative formula for solving equation, **using Taylor Series** and state its **limitations**.
- Find the real root of the equation correct to 6-decimal places using NR Method:
 - $x = e^{-x}$
 - $x \sin(x) + \cos(x) = 0$
 - $x \log(x) = 1.2$
 - $f(x) = 3x - \cos(x) - 1$
 - Reciprocal of 3
 - $3x = e^x$