Assignment#1

Bisection Method

(Binary Chopping of Half-interval)

1. Evaluate a real root of the following equations by Bisection Method correct to four decimal places:

a.
$$x^3 - x - 1 = 0$$

b.
$$x = \cos(x)$$

c.
$$e^x = 4\sin(x)$$

d.
$$f(x) = 3x - \sqrt{1 + \sin(x)}$$

False Position Method

 $(Regula-falsi/Interpolation\ Method)$

- 1. Write an algorithm to find a real root of a non-linear equation using Interpolation Method.
- 2. Using Regula-falsi method, compute the real root of the following equations correct to 3-decimal places:

a.
$$x \tan x = -1$$

c.
$$\sqrt[3]{3}$$

d.
$$xe^x = \sin(x)$$

e.
$$3x + \sin(x) = e^x$$

Secant Method

- 1. Explain the mechanism of finding a real root of a non-linear equation using Secant Method.
- 2. Write a pseudo-code to find a real root of a non-linear equation using Secant Method.
- 3. Find a root of the following equations correct up to 3 decimal places by the Secant Method:

a.
$$x^3 + x^2 + x + 7 = 0$$

b.
$$x \log_{10} x = 1.9$$

4. Evaluate $\sqrt{30}$ by Secant Method.

Fixed Point Iteration Method

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

1. Use the iteration method to find a root of the following equations to four decimal places:

a.
$$2^x - x - 3 = 0$$
 which lies between -2 & -3

b.
$$2x = \cos(x) + 3$$

c.
$$\cot(x) = x$$

Newton-Raphson Method

- 1. Derive Newton-Raphson Interactive formula for solving equation, **using Taylor Series** and state its **limitations**.
- 2. Find the real root of the equation correct to 6-decimal places using NR Method:

a.
$$x = e^{-x}$$

b.
$$x\sin(x) + \cos(x) = 0$$

c. Reciprocal of 3

d.
$$3x = e^x$$