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. $x \tan x = -1$
   b. Fourth root of 32
   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. $3x = e^x$