Assignment 5. Marks 10

Posted on 22.09.2021 and due on 02.10.2021 midnight

The following problems involve solving for zeros or roots of polynomials and other non-linear algebraic equations in one variable. This set will test your codes to choose proper bracketing and use of various root finding methods like bisection, regula falsi, Newton-Raphson etc. and compare converging efficiency among them. All the necessary functions will go in your own library (file) while the main code will simply read the input *i.e.* initialize, call relevant functions and write down the solutions.

1. Solve the following equation to an accuracy of 10^{-5}, starting from an initial guess interval $[1.6, 2.4]$,
$$\log(x/2) - \sin(5x/2) = 0.$$

   If the given interval does not bracket a root, numerically determine an interval that will. Use both Bisection and Regula-falsi method to solve the problem and compare them with a plot ($f(x_i)$ vs i) and a table showing convergence to a root x_i against number of steps i.   **[3]**

2. Make appropriate initial guesses (same interval for Bisection and Regula-falsi) and solve the following equation,

$$-x - \cos x = 0$$

   Use all three methods Bisection, Regula-falsi and Newton-Raphson to solve it. For Newton-Raphson, use x=0.0 as initial guess. Compare all three methods to achieve the same accuracy as above in Q1.   **[3]**

3. Find the roots (all real) of the following polynomial using the Laguerre's and synthetic division method,   **[4]**

$$P(x) = x^4 - 5x^2 + 4$$