

Assignment 4. Roots of nonlinear equations, polynomials and data-fitting

Posted on 18.10.2022 and due on 26.10.2022 midnight

1. Solve the following equation to an accuracy of 10^{-6} , starting from an initial guess interval $[1.5, 2.5]$,

$$\log(x/2) - \sin(5x/2) = 0.$$

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 and a table showing convergence to a root x_i against number of steps i . [3]

2. Make appropriate initial interval guess (same 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. Compare all three methods to achieve an accuracy of 10^{-6} . [3]

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

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

4. Fit the data given in the file `assign4fit.txt` using least square method with the following function, [5]

$$f(x) = a_0 + a_1x + a_2x^2 + a_3x^3$$