# 1 Assignment 1 - Solving Nonlinear Equations

- The function $h(x) = xsin(x)$ occurs in the study of undamped forced oscillations. Solve $h(x) = 1$ in [0,2] by:

  1. Halving the Interval (Bisection) Method
  2. The Method of False Position (regula falsi)
  3. Newton's Method
  4. Muller's method
  5. Fixed-point Iteration; $x = g(x)$ Method

- Tabulate the actual error values as the following; (See Table 1. The number of iterations is not limited to or defined as 15.)

- Plot the behaviours of the errors (use ratios) for the all cases. Compare and discuss the rate of convergence.

| n | Bisection $(x_n - r)$ | Regula Falsi $(x_n - r)$ | Newton $(x_n - r)$ | Muller $(x_n - r)$ | Fixed-point $(x_n - r)$ |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| n | Bisection $f(x_n)$ | Regula Falsi $f(x_n)$ | Newton $f(x_n)$ | Muller $f(x_n)$ | Fixed-point $f(x_n)$ |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |

Table 1: The Error Sequences