

Tutorial 2

1. Find a root (one root is, obviously, $x = 0$) of the equation: $f(x) = \sin x - (x/2)^2 = 0$ using Bisection method, Regula-Falsi method, Fixed Point method, Newton-Raphson method and Secant method. In each case, calculate true relative error and approximate relative error at each iteration (the true root may be taken as 1.933753762827021). Plot both of these errors (on log scale) vs. iteration number for each of the methods. Terminate the iterations when the approximate relative error is less than 0.01 %. Use starting points for Bisection, Regula-Falsi and Secant methods as $x = 1$ and $x = 2$ and for Fixed Point and Newton methods, $x = 1.5$.
2. Find *a root* of the following equation using Mueller's method to an approximate error of $\varepsilon_r \leq 0.1\%$:

$$x^4 - 2x^3 - 53x^2 + 54x + 504 = 0$$

Take the three starting values as 1, 2, and 3.

3. Find *all the roots* of the above polynomial using Bairstow's method with $\varepsilon_r \leq 0.1\%$. Use the starting guess as $\alpha_0 = 2$ and $\alpha_1 = 2$.