ESO 208A; ESO 218

Computational methods in engineering

Tutorial # 1

1. (a) Evaluate the polynomial $y = x^3 - 7x^2 + 8x - 0.35$ at x = 1.37. Use 3-digit arithmetic with chopping.

   Evaluate the percent relative error.

   (b) Repeat (**a**) but express y as $y = ((x-7)x+8)x - 0.35$

   Evaluate the error and compare with part (a)

2. Use forward and backward difference approximations of $O(h)$ and a central difference approximation of $O(h^2)$ to estimate the first derivative of the function $f(x) = 25x^3 - 6x^2 + 7x - 88$. Evaluate the derivative at $x = 2$ using a step size of $h = 0.2$. Compare the results with the true value of the derivative.

3. Determine the real root of $f(x) = -26 + 85x - 91x^2 + 44x^3 - 8x^4 + x^5$

(a) Graphically;

(b) Use the bisection method to determine the root to $\varepsilon_s = 10\%$. Initial guesses of $x_l = 0.5$ and $x_u = 1$.

(c) Perform the same computation as in (b) but use the false-position method and $\varepsilon_s = 0.2\%$.