ESO 208A: Computational Methods in Engineering

## Tutorial 3

Solution of Nonlinear equation

1. Find a solution in [0.1 1] for

   $$f(x) = 600x^4 - 550x^3 + 200x^2 - 20x - 1 = 0$$

   using the following methods;

   (a) Newton-Raphson method [use 0.5 as the guess value];

   (b) Secant method [use 0.1 and 1.0 for starting the iterations].

   Perform eight iterations for each method or stop if the approximate error is less than 0.05%.

   Comment on the convergence rate. Which is the best and the worst algorithm for the function?

Solution of system of Nonlinear equation

2. Solve the following equations using (a) fixed-point iteration and (b) Newton-Raphson method, starting with an initial guess of $x$=1.2 and $y$=1.2

   $$u(x, y) = x^2 - x + y - 0.75 = 0$$
   $$v(x, y) = x^2 - 5xy - y = 0$$

Multiple roots

3. Find a solution for

   $$f(x) = x^3 - 7x^2 + 16x - 12 = 0$$

   by the following methods. Use 1.0 as the guess value.

   (a) Newton-Raphson method;

   (b) First Modification of Newton-Raphson method [use multiplicity of root $m$ =2];

   (c) Second Modification of Newton-Raphson method.

   Comment on the convergence rate.

Roots of the polynomial

4. Solve the equation given in the problem 3 by Müller's method [use guess values $x_0$, $x_1$, and $x_2$ as 0.0, 1.25 and 3.25, respectively]