ENGG407 Quiz 1(B) – 2011
Taylor Series, Error Theories, and Nonlinear Functions

1. What is/are NOT the characteristics of a numerical method? [c]

a. Using approximation techniques to find solutions for an analytic function
b. Using iterative and/or recursive algorithms
c. Easier for human to carry out
d. Suitable for problems that cannot be or difficult to be solved analytically

2. What is NOT a sign that indicates a numerical method for solving root(s) for nonlinear functions is converging? [d]

a. A given tolerance for the independent variable is reached
b. The value of the function is approaching to 0
c. The length of the bracket is decreasing
d. The values of the function in two ends of the bracket become the same sign

3. For an arbitrary continuous function f(x), what is the condition that guarantees the existence of at least one root within the given bracket [a, b]? [b]

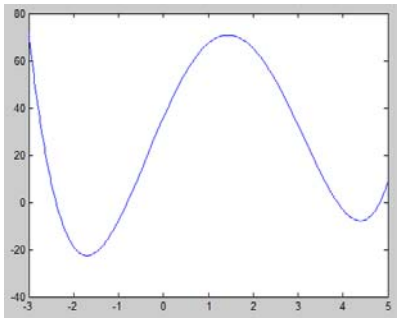
a. f(b) = 0 b. f(a) f(b) < 0
c. f(a) f(b) > 0 d. f(a) = 0

4. Given a function $f(x,y) = x^2 + 2xy - 3y^2$, what is the value of the first order Taylor expansion of the function at the points (1, 2)? [a]

a) $f(x,y) = -7 + 6(x-1) - 10(y-2)$
b) $f(x,y) = 7 + 6(x-1) + 10(y-2)$
c) $f(x,y) = -7 + 2(x-1)(x+y) + 2(y-2)(x-3y)$
d) $f(x,y) = 7 + 2(x-1)(x+y) - 2(y-2)(x-3y)$

$$f(x,y) = f(a,b) + [(x-a) f_x(a,b) + (y-b) f_y(a,b)] + \frac{1}{2!}[(x-a)^2 f_{xx}(a,b) + 2(x-a)(y-b) f_{xy}(a,b) + (y-b)^2 f_{yy}(a,b)] + \ldots + \frac{1}{n!}[\sum_{k=0}^{n} \frac{n!}{k!(n-k!)} (x-a)^k (y-b)^{n-k} \frac{\partial^n f(a,b)}{\partial x^k \partial y^{n-k}}]$$

5. The plot of a function $f(x) = x^4 - 5.5x^3 - 7.2x^2 + 43x + 36 = 0$ is as follows. [answer: Using spline or sections]



What is your strategy to find the roots of $f(x)$ in [-3, 5] using any single root finding method?