ENGG407 Quiz 1 – Taylor Series, Error Theories, and Nonlinear Functions
Monday, Sept. 29, 2014

[d] 1. What is/are the characteristics of numerical methods?

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

[c] 2. Given [x y z] = [23578.3 0.1892 75.22] and f = (x + y) × z = (23,578.3 + 0.1892) × 75.22 = 1,773,573.95823. What is the most accurate result obtained according to engineering data and error processing rules?

a. f = 1,773,573.95823 **b.** f = 1,773,573.96
c. f = 1,773,574.0 **d.** f = 1,773,573.9582

[b] 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*]?

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

[c] 4. In the *bisection* method, the root of $f(x)$ is to be determined in a given initial bracket $[a,b]$. After *n* iterations, what is the length of the bracket ($L_n = b_n - a_n$)?

a. L_n = (b-a) / n **b**. L_n = (b-a) * 2^n
c. L_n = (b-a) / 2^n **d.** L_n = (b-a) * n

[a] 5. Given a function $f(x) = 5\exp\left(\frac{x}{2}\right) + 3\sin(x)$, what is the first order Taylor expansion of the function at the point x_0? Hint: $f(x) = \sum_{i=0}^{n} \frac{f^{(i)}(x)}{i!}\Big|_{x=x_0} (x - x_0)^i$

a. $f(x) = f(x_0) + [\frac{5}{2}\exp(\frac{x_0}{2}) + 3\cos(x_0)](x - x_0)$

b. $f(x) = f(x) + [\frac{5}{2}\exp(\frac{x_0}{2}) + 3\cos(x_0)](x_0 - x)$

c. $f(x) = [\frac{5}{2}\exp(\frac{x_0}{2}) + 3\cos(x_0)](x - x_0)$

d. $f(x) = f(x_0)$