Multiple-Choice Test

Chapter 03.06
False-Position Method of Solving a Nonlinear Equation

1. The false-position method for finding roots of nonlinear equations belongs to a class of a (an) ____________ method.
   (A) open
   (B) bracketing
   (C) random
   (D) graphical

2. The newly predicted root for false-position and secant method can be respectively given as

   $$x_r = x_U - \frac{f(x_U)\{x_U - x_L\}}{f(x_U) - f(x_L)}$$

   and

   $$x_{i+1} = x_i - \frac{f(x_i)\{x_i - x_{i-1}\}}{f(x_i) - f(x_{i-1})},$$

   While the appearance of the above 2 equations look essentially identical, and both methods require two initial guesses, the major difference between the above two formulas is
   (A) false-position method is not guaranteed to converge.
   (B) secant method is guaranteed to converge
   (C) secant method requires the 2 initial guesses x_{i-1} *and* x_i to satisfy $f(x_{i-1}) \times f(x_i) < 0$
   (D) false-position method requires the 2 initial guesses x_L *and* x_U to satisfy $f(x_L) \times f(x_U) < 0$

3. Given are the following nonlinear equation

$$e^{-2x} + 4x^2 - 36 = 0$$

two initial guesses, $x_L = 1$ and $x_U = 4$, and a pre-specified relative error tolerance of 0.1%. Using the false-position method, which of the following tables is correct (x_r = predicted root)?

(A)

Iteration	x_L	x_U	x_r
1	1	4	?
2	?	?	2.939

(B)

Iteration	x_L	x_U	x_r
1	1	4	?
2	?	?	2.500

(C)

Iteration	x_L	x_U	x_r
1	1	4	?
2	?	?	1.500

(D)

Iteration	x_L	x_U	x_r
1	1	4	?
2	?	?	2.784

4. Given are the following nonlinear equation

$$e^{-2x} + 4x^2 - 36 = 0$$

two initial guesses, $x_L = 1$ and $x_U = 4$, and a pre-specified relative error tolerance of 0.1%. Using the false-position method, which of the following tables is correct (x_r = predicted root, $|\in_a|$= percentage absolute relative approximate error).

(A)

Iteration	x_L	x_U	x_r	$\|\in_a\|\%$
1	1	4	?	?
2	?	?	?	11.63

(B)

Iteration	x_L	x_U	x_r	$\|\in_a\|\%$
1	1	4	?	?
2	?	?	?	6.11

(C)

Iteration	x_L	x_U	x_r	$\|\in_a\|\%$
1	1	4	?	?
2	?	?	?	5.14

(D)

Iteration	x_L	x_U	x_r	$\|\in_a\|\%$
1	1	4	?	?
2	?	?	?	4.15

5. The root of $(x-4)^2(x+2)=0$ was found using false-position method with initial guesses of $x_L = -2.5$ and $x_U = -1.0$, and a pre-specified relative error tolerance of 10^{-6}%. The final converged root was found as $x_r == -1.9999997$, and the corresponding percentage absolute relative approximate error was found as $|\in_a| = 8.7610979 \times 10^{-5}\%$. Based on the given information, the number of significant digits of the converged root x_r that can be trusted at least are

(A) 3
(B) 4
(C) 5
(D) 6

6. The false-position method may have difficulty in finding the root of $f(x) = x^2 - 7.4x + 13.69 = 0$ because
   (A) $f(x)$ is a quadratic polynomial
   (B) $f'(x)$ a straight line
   (C) one cannot find initial guesses x_L and x_U that satisfy $f(x_L)\ f(x_U) < 0$
   (D) the equation has two identical roots.