Test 4, 26.04.2017

1. To find the root of $f(x)=0$, a scientist is using the bisection method. At the beginning of an iteration, the lower and upper guesses of the root are x_l and x_u. At the end of the iteration, the absolute value of relative approximate error in the estimated value of the root would be

   (A) $\left|\dfrac{x_u}{x_u + x_\ell}\right|$

   (B) $\left|\dfrac{x_\ell}{x_u + x_\ell}\right|$

   (C) $\left|\dfrac{x_u - x_\ell}{x_u + x_\ell}\right|$

   (D) $\left|\dfrac{x_u + x_\ell}{x_u - x_\ell}\right|$

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 $f(x_{i-1})f(x_i) < 0$
   (D) false-position method requires the 2 initial guesses x_L *and* x_U to satisfy $f(x_L)f(x_U) < 0$

3. The next iterative value of the root of $x^2 - 4 = 0$ using the Newton-Raphson method, if the initial guess is 3, is

   (A) 1.5
   (B) 2.067
   (C) 2.167
   (D) 3.000

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)?

(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

5. The value of $\int_{0.2}^{2.2} xe^x dx$ by using the three-segment trapezoidal rule is most nearly

(A) 11.672
(B) 11.807
(C) 12.811
(D) 14.633