Scientific Computing using Matlab

Live session - Week 3

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1. Assuming an initial bracket of [1,5], the second iterative value of the root of $te^{-t} - 0.3 = 0$, using the bisection method is

A. 0

B. 1.5

C. 2 ✓

D. 3

2. The root of the equation $f(x) = 0$ is found by utilising the Newton-Raphson method. The underlying initial guess of the root is $x_0 = 3, f(3) = 5$. The angle the line tangent to the function $f(x)$ makes at $x = 3$ is 57° w.r.t. the x-axis. The next estimate of the root, x_1, must nearly is

A. -3.2470

B. -0.24704 ✓

C. 3.2470

D. 6.2470

3. A bound for the number of iterations needed to achieve an approximation with accuracy 10^{-4} to the solution of $x^3 - x - 1 = 0$ lying in the interval [1,2] in Bisection method is

A. 9

B. 11

C. 8

D. 14 ✓

4. Let $g \in \mathbb{C}[1,2]$ and for any number p_0 in $[1,2]$, the sequence defined by $p_n = g(p_{n-1}),\ n \geq 1$. Then for which g, the Fixed-Point theorem gives to guarantee the sequence p_n converges to the unique fixed point p in $[1,2]$

A. $g(x) = x - x^3 - 4x^2 + 10$

B. $g(x) = \frac{1}{2}(10 - x^3)^{1/2}$

C. $g(x) = (10/(4 + x))^{1/2}$ ✓

D. $g(x) = ((10/x) - 4x)^{1/2}$

5. For finding the root of $\cos x = 0$ by the Secant method, which of the following choice of initial guesses would not be appropriate

A. $\pi/4$ and π

B. $\pi/4$ and $3\pi/4$

C. $-\pi/2$ and $\pi/2$ ✓

D. $\pi/3$ and $3\pi/4$

6. The secant method formula for finding the cube root of a real number R from the equation $x^3 - R = 0$ is

A. $(x_i\, x_{i-1} + R)/(x_i + x_{i-1})$

B. $(2\, x_i^2 + x_i\, x_{i-1} - R)/(x_i + x_{i-1})$

C. $(x_i\, x_{i-1}^2 + x_i^2\, x_{i-1} + R)/(x_i^2 + x_{i-1}^2 + x_i\, x_{i-1})$ ✓

D. $(x_i\, x_{i-1} - R)/(x_i^2 + x_{i-1}^2 - 2\, x_i\, x_{i-1})$

7. Using Newton's method to approximate, to within 10^{-4}, the value of x that produces the point on the graph of $y = x^2$ that is closest to (1,0) is (use initial as $r_0 = 1$)

A. 0.499755

B. 0.589755 ✓

C. 0.67843

D. None of these

8. Using method of False position, what is the solution accurate within 10^{-4} for the problem $x^3 + 3x^2 - 1 = 0$ on the interval $[-3, -2]$ (use end points as initial guess)

A. -2.87938 ✓

B. 0.52234

C. -2.5278

D. None of these