Question

If Newton's method converges to a simple (i.e., non-repeated) real root, then the order of convergence equals

- 0.5
- 1

Correct Answer

- 2

Question

Starting with the initial guess $x_0 = 1$, the first Newton iterate x_1 for computing $(2023)^{1/100}$ is equal to

Correct Answer

- 21.22
- -21.22
- 22.21
- -22.21

Question

Suppose a nonlinear equation has repeated real roots. If the Newton's method locally converges to such a root, then the rate of convergence must be

- quadratic.
- cubic.

Correct Answer

- linear.

Question

To calculate the root of the equation $x^2 + x + \frac{1}{4} = 0$, the Newton recursion is given by

- $x_{n+1} = \frac{x_n}{2} + \frac{1}{4}$
- $x_{n+1} = -\frac{x_n}{2} + \frac{1}{4}$

Correct Answer

- $x_{n+1} = \frac{x_n}{2} - \frac{1}{4}$

Question

For bisection method, the asymptotic error constant equals

Correct Answer

- 0.5
- 1
- 2

Question

Consider two nonlinear equations:

$f_1(x) := x^3 + x - 1 = 0,$

$f_2(x) := 2x^5 - 5x^4 + 20x^3 - 10x^2 + 10x - 1 = 0.$

Each of them has unique real root in the interval [0, 1.5].

Suppose we use the bisection algorithm to compute the respective unique real roots with the same input interval [0, 1.5] and the same numerical tolerance. The number of bisection iterations executed for the two equations

Correct Answer

- will be the same.
- will NOT be the same.
- may or may not be the same.

Question

The bisection method to find a real root of the equation $f(x) = 0$ in the interval $[a, b]$requires that for all $x \in [a, b]$, the function f is

Correct Answer

- continuous but not necessarily differentiable.
- continuous AND differentiable.
- continuously differentiable.

Question

Running the bisection algorithm may settle into an oscillation.

Correct Answer

- FALSE.
- TRUE.

Question

For $f \in C([a, b])$, suppose $f(a)$ and $f(b)$ have the same signs.

How many real roots for $f(x) = 0$ can be there in the interval $[a, b]$?

- Exactly one real root.
- An odd number of real roots.

Correct Answer

- Either zero or a nonzero even number of real roots.

Question

The equation $f(x) = x^4 + 2x^2 - 1 = 0$ has

Correct Answer

- at least one real root in [0,1].
- no real root in [0,1].
- no real root.

Question

The nonlinear equation $x = \sin x + \cos x$ has

- exactly one real root between -pi/2 and 0.
- no real root between 0 and pi/2.

Correct Answer

- at least one real root between 0 and pi/2.