MATHS

BOOKS - ML KHANNA

NUMERICAL METHODS

Problem Set 1 Multiple Choice Questions

1. The equation $f(x) = 0$ possesses same signs for $f(a)$ and $f(b)$, then

A. at least one root of the equation lies in

$$a < x < b$$

B. either no root or an even number of roots lie

in the interval $a < x < b$

C. any number of roots may lie in $a < x < b$

D. none of these

Answer: B

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2. If all the roots of the equation $x^2 - 3x + k = 0$ are real, then k lies in the interval

    A. $(-0, -1)$

    B. $(-2, 2)$

    C. $(1, 0)$

    D. none of these

Answer: B

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3. Using successive bisection method the approximate value of a root of the equation $x^3 - 9x + 1 = 0$ lying between $x = 2$ and $x = 4$ at the end of fourth iteration is

A. 2.88

B. 2.75

C. 2.65

D. none of these

Answer: A

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4. Using method of interval halving, the equation $x^4 - x^3 - 2x^2 - 6x - 4 = 0$ has the approximate value of the root lying between 2 and 3 upto third iteration

A. 2.735

B. 2.69

C. 2.63

D. none of these

Answer: C

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5. Applying Newton's iterative formula the value of $\sqrt{29}$ upto three decimal places is

    A. 5.384

    B. 5.381

    C. 5.387

    D. none of these

Answer: C

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6. The approximate value of $(10)^{1/3}$ by Newton's formula correct to four places of decimal is

A. 2.1547

B. 2.1545

C. 2.1544

D. none of these

Answer: C

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7. The approximate value of the reciprocal of 3 by iteration using $X_0 = 0.3$ upto four decimal places is

A. 0.331

B. 0.3325

C. 0.3333

D. none of these

Answer: C

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8. Using Newton-Raphson's method, the approximate value of the root of the equation $x^4 - x - 10 = 0$ near to the values 2, correct to three decimal places is

A. 1.856

B. 1.735

C. 1.674

D. none of these

Answer: A

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9. The root of the equation $x^2 - 5x + 2 = 0$ correct to three decimal places by the Newton-Raphson method is

A. $0 : 438$

B. 4.562

C. 3.753

D. none of these

Answer: A::B

10. The root of the equation $f(x) = 0$ in the interval (a,b) is given by

A. $\dfrac{af(b) - bf(a)}{b - a}$

B. $\dfrac{bf(a) - af(b)}{f(b) - f(a)}$

C. $\dfrac{af(b) - bf(a)}{f(b) - f(a)}$

D. none of these

Answer: C

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11. The Newton-Raphson method for finding the root of an equation $f(x) = 0$ is

A. $x_{n+1} = x_n - \dfrac{f'(x_n)}{f(x_n)}$

B. $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$

C. $x_{n+1} = x_n + \dfrac{f(x_n)}{f'(x_n)}$

D. none of these

Answer: B

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12. Let $f(x) = 0$ be an equation and x_1, x_2, be.two real numbers such that $f(x_1)f(x_2) < 0$, then $f(x) = 0$ has

A. at least one root or an odd number of roots in (x_1, x_2)

B. any number of roots in (x_1, x_2)

C. no root or an even number of roots in (x_1, x_2)

D. none of these

Answer: A

13. Using Regula False method the real root of the equation $x - x^4 - x^3 - 1 = 0$ lying between 1 and 2 upto second approximation is

A. 1.526

B. 1.416

C. 1.234

D. none of these

Answer: B

14. In Simpson's one-third rule the integrand $\int_a^b f(x)dx$ assumes the shape of a curve given by

A. Parabola

B. hyperbola

C. circle

D. none of these

Answer: A

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15. The evaluation of the definite integral $\int_{a}^{b} f(x)dx$ by Simpson's one-third rule requires the interval [a,b] to : be divided into number of sub-intervals of equal width

    A. 2n intervals

    B. 2n +1 intervals

    C. 3n intervals of equal width

    D. any number of intervals

Answer: A

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16. Trapezoidal rule for evaluation of so $\int_a^b f(x)dx$ requires the interval (a, b) to be equally divided into

A. 2n intervals

B. 2n +1 intervals

C. 3n intervals

D. any number of intervals

Answer: D

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17. Using the data $e = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60,$ the value of the definite integral $\int_0^4 e^x dx$ by Simpson's rule is

A. 53.6

B. 53.7

C. 53.873

D. none of these

Answer: C

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18. Calculating $\int_2^{10} \dfrac{dx}{1+x}$ by dividing the range into eight equal parts, the approximate value upto three places of decimal is

A. 1.234

B. 1.356

C. 1.298

D. 1.3

Answer: D

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19. The value of the integral $\int_{2}^{10} \frac{dx}{1+x}$ on dividing the interval $(0,2)$ into four equal parts by Trapezoidal rule is

A. 1.1234

B. 1.1183

C. 1.1167

D. none of these

Answer: C

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20. In two consecutive roots of the equation $f(x) = 0$. are $\alpha, \alpha + h$, where his small, then h is given by

A. $\dfrac{f(\alpha)}{f'(\alpha)}$

B. $\dfrac{f'(\alpha)}{f(\alpha)}$

C. $\dfrac{-f'(\alpha)}{f(\alpha)}$

D. $-\dfrac{f(\alpha)}{f'(\alpha)}$

Answer: D

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21. The equation $x^3 - 3x + 4 = 0$ has only one real root. Its first approximate value by the method of false position in the interval (-3,-2) is

A. -2.125

B. 2.125

C. -2.812

D. 2.812

Answer: A

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Self Assessment Test

1. The first approximation to a real zero of the polynomial $x^3 - 2x - 5$ upto 3 decimal places by the 'false position' method is

A. 2.578

B. 2.057

C. 2.058

D. none of these

Answer: C

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2. The formula where $(f(x_{n-1})$ and $f(x_n))$ have opposite sign at each step $n \geq 1$ of method of false opsition of successive approximation to find the approximate value of a root of the equation $f(x) = 0$ is

A.

$$x_{n+1} = x_n - \frac{f(x_n) - f(x_{n-1})}{f(x_n)} (x_n - x_{n-1})$$

B.

$$x_{n+1} = x_n - \frac{f(x_n)}{f(x_n) - f(x_{n-1})} (x_n - x_{n-1})$$

C.

$$x_{n+1} = x_n + \frac{f(x_n) + f(x_{n-1})}{f(x_n)} (x_n - x_{n-1})$$

D. none of these

Answer: B

3. Approximate value of $\int_{x_0}^{x_0+nh} dx$ by trapezoidal rule is

A. $\dfrac{h}{2}\left(y_0 + y_n + (y_1 + y_2 + \dots + y_{n_1})\right)$

B.

$\dfrac{h}{2}[y_0 + y_n + 4(y_1 + y_3 + \dots) + 2(y_2 + y_4 \dots)]$

C. both (a) and (b)

D. none of these

4. By the application of Simpson's 1/3 rule for numerical integration, with two sub-intervals the value of $\int_0^1 \dfrac{dx}{1+x}$ is

A. $\dfrac{17}{24}$

B. $\dfrac{17}{36}$

C. $\dfrac{25}{36}$

D. $\dfrac{25}{17}$

Answer: C

5. If $\displaystyle\int_a^b f(x)dx$ is numerically integrated by Simpson's rule then in any pair of consecutive sub-intervals by which of the following curves, the curve $y = f(x)$ is approximated

   A. straight line

   B. parabola

C. circle

D. ellipse

Answer: B

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6. If $y = 2x^3 - 2x^2 + 3x - 5$ then for $x = 2$ and $\Delta x = 0.1$, the value of Δy is

A. 2.002

B. 1.9

C. 0

D. 0.9

Answer: B

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7. The approximate value of $\sqrt[5]{33}$ correct to 4 decimal places is

A. 2.0000

B. 2.1001

C. 2.0125

D. none of these

Answer: C

8. The value of the root nearest to the 2 after first iteration of the equation $x^4 - X - 10 = 0$ by Newton-Raphson method

A. 2.321

B. 2.125

C. 1.983

D. 1.871

Answer: D

9. Let $f(0) = 1$, $f(1) = 2.72$, then the trapezoidal rule gives approximate value of so $\int_0^1 f(x)dx$

A. 3.72

B. 1.86

C. 1.72

D. 0.86

Answer: B

10. Simpson's $\dfrac{1}{3}$ rule for evaluation $\displaystyle\int_a^b f(x)dx$ requires the interval $[a, b]$ to be divides into

    A. an even number of sub-intervals of equal width

    B. any number of sub-intervals

    C. any number of sub-intervals of equal width

    D. none of these

Answer: A