MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 33

Mathematics

1. Let $f(x) = \max\{\tan x, \cot x\}$. Then the number of roots of the equation $f(x) = \frac{1}{2}$ in $(0, 2\pi)$ is

A. 0

B. 1

C. 2

D. 4

Answer: A

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2. If set $A = \{x : \tan x = \sec x, x \in [0, 4\pi]\}$ and set $B = \{x : \sin^2 x = 1, x \in [0$, then

A. $A \subset B$

B. $A = B$

C. $A \cap B = B$

D. $n(A \times B) = 0$

Answer: D

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3. The number of eight - digit integers, with the sum of digits equal to 12 and formed by using of digits 1, 2 and 3 only are

A. 255

B. 277

C. 288

D. 266

Answer: D

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4. The mean and standard deviation of 10 observations $x_1, x_2, x_3 \ldots\ldots x_{10}$ are $\bar{x}$ and σrespectively. Let 10 is added to $x_1, x_2 \ldots . x_9$ and 90 is substracted from x_{10}. If still, the standard deviation is the same, then $x_{10} - \bar{x}$ is equal to

A. 35

B. 45

C. 55

D. 50

Answer: B

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5. If α, β be the roots of $4x^8 - 16x + c = 0, c \in R$ such that $1 < \alpha < 2$ and $2 < \beta < 3$, then the number of integral values of c is

A. 2

B. 3

C. 4

D. 5

Answer: B

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6. A pole stands vertically in the center of a square. When 45° is the elevation of the sun, the tip of its shadow just reaches the side of the

square and is at a distance of 30 meters and 40 meters from the ends of that side. The height of the pole is

A. 50 meters

B. 25 meters

C. $25\sqrt{2}$ meters

D. $50\sqrt{2}$ meters

Answer: C

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7. If the area bounded by $y = x, y = \sin x$ and $x = \frac{\pi}{2}$ is $\left(\frac{\pi^2}{k} - 1\right)$ sq. units then the value of k is equal to

A. 2

B. 3

C. 6

D. 8

Answer: D

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8. A bag contains 10 white and 3 black balls. Balls are drawn one-by-one without replacement till all the black balls are drawn. The probability that the procedure of drawing balls will come to an end at the seventh draw, is

A. $\frac{15}{286}$

B. $\frac{105}{286}$

C. $\frac{35}{286}$

D. $\frac{7}{286}$

Answer: A

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9. Consider the function $f(x) = \left(x^3 - x\right)\left|x^2 - 6x + 5\right|$, $\forall x \in R$, then f(x) is

A. discontinuous at x = 1

B. discontinuous at x = 5

C. non differentiable at x = 1

D. non differentiable at x = 5

Answer: D

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10. The solution of the differential equation $\frac{dy}{dx} + xy\ln y = x^3 y$ is equal to (where, C is the constant of integration)

A. $\ln y = x^2 + Ce^{-x^2}$

B. $\ln y = x^2 - 2 + Ce^{-x^2}$

C. $\ln y = x^2 - 2 + ce^{-\frac{x^2}{2}}$

D. $\ln y = x^2 + Ce^{-\frac{x^2}{2}}$

Answer: C

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11. If $f: R \to \left[\frac{\pi}{3}, \pi\right)$ defined by $f(x) = \cos^{-1}\left(\frac{\lambda - x^2}{x^2 + 2}\right)$ is a surjective function, then the value of λ is equal to

A. 0

B. 3

C. 2

D. 1

Answer: D

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12. The first three terms of a geometric progression are 3, -1 and $\frac{1}{3}$. The next term of the progression is

A. 2

B. -2

C. $\frac{-1}{9}$

D. $\frac{-5}{9}$

Answer: C

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13. Let $P = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 16 & 4 & 1 \end{bmatrix}$ and I be the identity matrix of order 3. If $Q = [qij]$ is a matrix, such that $P^{50} - Q = I$, then $\frac{q_{31} + q_{32}}{q_{21}}$ equals

A. 52

B. 103

C. 201

D. 205

Answer: B

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14. The plane 2x-2y+z=3 is rotated about its line of intersection with the x-y plane by an acute angle α. If the new position of the plane contains the point (3,1,1)then thevalue of cosα=

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{7}{9}$

D. $\frac{4}{9}$

Answer: C

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15. Two tangents are drawn from a point $(-4, 3)$ to the parabola $y^2 = 16x$. If α is the angle between them, then the value of $\cos\alpha$ is

A. 0

B. $\frac{1}{2}$

C. $\frac{\sqrt{3}}{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: A

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16. The integral $I = \int 2^{(2^x + x)}\, dx = \lambda.\left(2^{2^x}\right) + C$ (where, C is the constant of integration). Then the value of $\sqrt{\lambda}$ is equal to

A. $\frac{1}{\ln 4}$

B. $\frac{1}{(\ln 2)^2}$

C. $\frac{1}{\ln 2}$

D. $\frac{1}{(\ln 4)^2}$

Answer: C

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17. The function $y = x^4 - 8x^3 + 22x^2 - 24x + 10$ attains local maximum of minimum at $x = a, x = b$ and $x = c(a < b < c)$. Then a, b and c are in

A. Geometric progression

B. Harmonic progression

C. Arithmetic progression

D. none of these

Answer: C

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18. The radius of the circle touching the line $x + y = 4$ at $(1, 3)$ and intersecting $x^2 + y^2 = 4$ orthogonally is

A. $\frac{3\sqrt{2}}{4}$ units

B. $\frac{3}{4}$ units

C. $\frac{3}{\sqrt{2}}$ units

D. $\frac{4\sqrt{2}}{3}$ units

Answer: A

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19. The value of the integral $\int_{-3\pi}^{3\pi} |\sin^3 x| dx$ is equal to

A. π

B. 8π

C. 1

D. 8

Answer: D

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20. Let B and C are points of interection of the parabola $y = x^2$ and the circle $x^2 + (y-2)^2 = 8$. The area of the triangle OBC, where O is the origin, is

A. 2

B. 4

C. 6

D. 8

Answer: D

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21. The value of $\lim_{x \to 0} \left(\frac{1}{x^{18}}\right) 1 - \cos\left(\frac{x^3}{3}\right) - \cos\left(\frac{x^6}{6}\right) + \cos\left(\frac{x^3}{3}\right) . \cos\left(\frac{x^6}{6}\right)\Big)\lambda^2,$ then the value of 900λ is equal to $(\text{here}, \quad \lambda > 0)$

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22. The equation $Im\left(\frac{iz-2}{z-i}\right) + 1 = 0, z\&\varepsilon; C, z \neq i$ represents a part of a circle having radius equal to.4

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23. In the expansion of $(ax+b)^{2020}$, if the coefficient of x^2 and x^3 are equal, then the value of $\frac{9}{100}\left(\frac{b}{a}\right)$ is equal to

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24. If A is an invertible matrix of order 3 and B is another matrix of the same order as of A, such that $|B| = 2, A^T|A|B = A|B|B^T.$ If

$\left|AB^{-1}adj\left(A^{T}B\right)^{-1}\right| = K$, then the value of 4K is equal to

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25. If the line segment joining P(2, 3) and Q(5, 7) subtends a right angle at R(x, y) and the area of $\Delta PQR = 2$ sq. units, then the maximum number of such points R is xy - plane are

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