MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 72

Mathematics

1. Let f(x) be a derivable function at x = 2 and $\lim_{h \to 0} \frac{f(2+h)}{\sin h} = 3$, then $\frac{f(2) + f'(2)}{f(2) - f'(2)}$ is equal to

A. 0

B. 1

C. 3

D. -1

Answer: B

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2. The equation $(5x-1)^2+(5y-2)^2=(\lambda^2-4\lambda+4)(3x+4y-1)^2$ represents an ellipse if $\lambda \in$

A. $(0, 1]$

B. $(-1, 2)$

C. $(2, 3)$

D. $(-1, 0)$

Answer: C

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3. For any two statements p and q, which of the following is true

A. ~$(p \leftrightarrow$ ~$q)$ is a tautology

B. ~$(p \leftrightarrow$ ~$q)$ is a contradiction

C. ~$(p \leftrightarrow$ ~$q)$ is equivalent to $p \leftrightarrow q$

D. ~$(p \leftrightarrow$ ~$q)$ is equivalent to ~$p \leftrightarrow q$

Answer: C

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4. If

$a_1x^3 + b_1x^2 + c_1x + d_1 = 0$ and $a_2x^3 + b_2x^2 + c_2x + d_2 = 0$

have a pair of common positive repeated roots. If the value of

$$\begin{vmatrix} 3a_1 & 2b_1 & c_1 \\ 3a_2 & 2b_2 & c_2 \\ a_2b_1 - a_1b_2 & c_1a_2 - c_2a_1 & d_1a_2 \\ & -a_2d_2 & \end{vmatrix}$$ is

A. 3

B. 2

C. 1

D. 0

Answer: D

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5. If matrix $A = [a_{ij}]_{3 \times 3}, B = [b_{ij}]_{3 \times 3}$ where $d_{ij} + a_{ji} = 0$ and $b_{ij} - b_{ji} = 0 \forall i$, j then $A^4 B^3$ is

A. Singular matrix Correct Answer

B. Zero matrix

C. Symmetric matrix

D. Skew symmetric matrix

Answer: A

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6. Let P a point on $y^2 = 4x$ such that its focal distance is 4. Let T be the point of intersection of tangents drawn at P and vertex of the parabola. If S is focus and 'R' is an interior point on the axis of the parabola at a distance 4 unit from S, then area of quadrilateral PRST is equal to

A. $3\sqrt{3}$

B. $4\sqrt{3}$

C. $6\sqrt{3}$

D. $5\sqrt{3}$

Answer: C

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7. The angle between the asymptotes of a hyperbola is 30°. The eccentricity of the hyperbola is

A. $\sqrt{2} \pm \sqrt{3}$

B. $\sqrt{3} \pm \sqrt{5}$

C. $\sqrt{2 \pm 4\sqrt{3}}$

D. $\sqrt{7} \pm \sqrt{2}$

Answer: C

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8. A coin is tossed 7 times, Then probability that at least 4 consecutive heads appear is

A. $\frac{3}{16}$

B. $\frac{5}{32}$

C. $\frac{1}{8}$

D. $\frac{1}{4}$

Answer: B

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9. The slope of the tangent to the curve represented by $x = t^2 - 3t + 1$ & $y = 2t^2 + 3t - 4$ at the point $M(-1, 10)$ is :

A. 9

B. 10

C. 11

D. 12

Answer: C

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10. If $\overrightarrow{c}$ is directed along the internal bisector of the angle between the vectors $\overrightarrow{a} = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $\overrightarrow{b} = -2\hat{i} - \hat{j} + 2\hat{k}$ with $\left|\overrightarrow{c}\right| = 5\sqrt{6}$, then $\overrightarrow{c}$ is

A. $\frac{5}{3}\left(\hat{i} - 7\hat{j} + 2\hat{k}\right)$

B. $\frac{5}{3}\left(5\hat{i} + 5\hat{j} + 2\hat{k}\right)$

C. $\frac{5}{3}\left(\hat{i} + 7\hat{j} + 2\hat{k}\right)$

D. $\frac{5}{3}\left(-5\hat{i} + 5\hat{j} + 2\hat{k}\right)$

Answer: A

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11. If the largest value of the $\lim_{x \to \infty} \left(1 + \frac{a}{x}\right)^{\frac{x}{b}}$ where a, b lies in the interval $\left[\frac{1}{5}, 403\right]$ is e^{λ}, then λ equals

A. 2015

B. 2016

C. 2017

D. 2018

Answer: A

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12. If Rolle's theorem can be applied to f (x) = xlnx, $x > 0$ in interval $\left[\frac{1}{a}, \frac{1}{b}\right]$ where $a, b \in I^{+}$ then b equals

A. 1

B. 2

C. 3

D. infinite possible values exist

Answer: B

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13. $\int e^{\sec x}\left(\tan^2 x+\cos x\right)dx$ is equal to [Note: Where C is a constant of integration]

A. $e^{\sec x} \cdot \sin x + C$

B. $e^{\sec x} \cdot \cos x + C$

C. $e^{\sec x}. \tan x + C$

D. $e^{\sec x}. \cot x + C$

Answer: A

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14. The value of $\frac{\sum_{i=1}^{44}\cos(i^\circ)}{\sum_{i=1}^{44}\sin(i^\circ)} - \frac{\sum_{i=1}^{44}\sin(i^\circ)}{\sum_{i=1}^{44}\cos(i^\circ)}$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer: B

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15. The area bounded by the curve $y = x^2 + 4x + 5$, the axes of co ordinates and the minimum ordinate is

A. $3\frac{2}{3}$ sq.units

B. $4\frac{2}{3}$ sq.units

C. $5\frac{2}{3}$ sq.units

D. $\frac{8}{3}$ sq.units

Answer: B

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16. The number of solutions of $\sec^2\theta \operatorname{cosec}^2\theta + 2\operatorname{cosec}^2\theta = 8, 0 \leq \theta$ is $\leq \pi/2$

A. 4

B. 3

C. 0

D. 2

Answer: D

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17. Let

$$f(x) = 7\sin^{-1}\left(\frac{2x}{1+x^2}\right) + 5\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) - 4\tan^{-1}\left(\frac{2x}{1-x^2}\right)$$

then $\forall x \in \left(1, \sqrt{3}\right)$, $f(x)$ is

A. $11\pi + 12\tan^{-1}x$

B. $11\left(\pi - \tan^{-1}x\right)$

C. $11\pi - 12\tan^{-1}x$

D. None

Answer: C

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18. Let $\overline{X}$ and M.D. be the mean and the mean deviation about $\overline{X}$ of n observations $x_i \, \forall i = 1, 2, 3, \ldots .., n$. If each of the observations is increased by 5, then the value of new mean and the mean deviation about the new mean respectively, are

A. $\overline{X} + 5, M.D.$

B. $\overline{X} + 5, M.D. + 5$

C. $\overline{X}, M.D. + 5$

D. $\overline{X}, M.D.$

Answer: A

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19. If a curve passing through (1, 2) satisfies the differential equation $y(1 + xy)dx - xdy = 0$, then which of the following is true?

A. $f(x) = \dfrac{2x}{2 - x^2}$

B. $f(x) = \dfrac{x+1}{x^2+1}$

C. $f(x) = \dfrac{x-1}{4-x^2}$

D. $f(x) = \dfrac{4x}{1-2x^2}$

Answer: A

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20. Relation R defined in set of real numbers by $R = \{(a, b) : a \leq b^3\}$ is

A. Reflexive

B. Symmetric

C. Transitive

D. None of these

Answer: D

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21. 20 lines are drawn in a plane. No two lines are parallel and no three are concurrent. Find the number of disjoint parts these lines divide the plane into.

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22. If the minimum value of the function $f(x) = 8^{\sin^{-1} x} + 8^{\cos^{-1} x}$ is m, then the value of $(\sec(\log_2 m - 1))^8$ is equal to

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23. Find the value of n, if the sum of the coefficients of $1^{st}, 2^{nd}$ and 3^{rd} terms in the expansion of $\left(x - \frac{3}{x^2}\right)^n, x \neq 0 n \in N$ is 559

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24. Let f (x) be a function defined as $f : R \to R$ such that f (x + 2) + f (x-2) = f (a) and f (1) = 3 then the value of the expression $\sum_{r=0}^{15} f(1+12r)$ is equal to

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25. OABC is a tetrahedron in with O as the origin and position vectors of points A, B, C as $\hat{i}+2\hat{j}+3\hat{k}, 2\hat{i}+\alpha\hat{j}+\hat{k}$ and $\hat{i}+3\hat{j}+2\hat{k}$ respectively, then the integral value of α to have shortest distance between $\overrightarrow{OA}$ & $\overrightarrow{BC}$ as $\sqrt{\frac{3}{2}}$, is

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26. Let $z_1 = 10 + 6i$ and $z_2 = 4 + 6i$. If z is any complex number such that the argument of 1 is , then the value of $\frac{z - z_1}{z - z_2}$ is $\frac{\pi}{4}$ then the value of $[|z - 7 - 9i|]$ (where [.] is greatest integer function).

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27. If Ω_1 be a circle with centre and diameter AB & P be a point on the segment OB. Suppose another circle Ω_2 with centre P lies in the interior of 121. Tangents are drawn from A and B to the circle Ω_2 intersecting Ω_1 again at A_1 and B_1 respectively such that A_1 and B_1 are on the opposite sides of AB. Given that $A_1B = 5$, $AB_1 = 15$ and OP = 10, If r is the radius of Ω_1 Then $\left[\frac{r}{10}\right]$ equals

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28. The equations of altitudes of a triangle are given as x + y = 0, x - 4y = 0 and 2x - y = 0. If the locus of the centroid of this triangle is ax + by = 0 (where a and b are positive integers and coprime to each other) and one of its vertex has the coordinates $(-\lambda, \lambda)$, then the value of (a + 2b) is

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29. The set of values of 'c' for which the equation: $x^3 - 6x^2 + 3x - c$ is of the form $(x - a)^2(x - \beta)$, $[\alpha, \beta \in R]$ is {a,b} then find the value of a + b

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