MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 42

Mathematics Single Choice

1. Let $\left(1-x-2x^2\right)^6 = 1 + a_1x + a_2x^2 + \ldots + a_{12}x^{12}$. Then $\frac{a_2}{2^2} + \frac{a_4}{2^4} + \frac{a_6}{2^6} + \ldots\ldots + \frac{a_{12}}{2^{12}}$ is equal to

A. -1

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

C. 0

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

Answer: B

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2. Let z, w be two complex numbers such that |z| = 1 and $\frac{w-1}{w+1} = \left(\frac{z-1}{z+1}\right)^2$. Then maximum value of |w+1| is :-

A. $\sqrt{2}$

B. 2

C. 1

D. $1+\sqrt{2}$

Answer: B

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3. If (x, y) are the co-ordinates of a point in the plane, then

then $\begin{vmatrix} 3 & 4 & 2 \\ 5 & 8 & 2 \\ x & y & 2 \end{vmatrix} = 0$ represent

A. a. st. line || to y-axis

B. a st., line || to x-axis

C. a st. lne

D. a circle

Answer: C

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4. There are 7A & 6B and they are to be arranged linearly, then number of palindromes are

A. 30

B. 40

C. 50

D. None of these

Answer: D

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5. If range of $f(x) = \frac{x^2 - 3x + 2}{x^2 - ax + 4}$ is R – {1} then sum of all possible real value(s) of 'a' is

A. 4

B. 3

C. 5

D. None

Answer: A

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6. $\lim_{n \to \infty} \sum_{x=1}^{n} \frac{2r-1}{2^r}$ is equal to -

A. 1

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

C. 3

D. 6

Answer: C

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7. Consider the following relations R= {(x, y) | x, y are real numbers and x = wy for some rational number w} $S = \left\{ \left(\frac{m}{n}, \frac{p}{q} \right) \right.$ where m, n, p and q are integers such that n, $q \neq 0$ and qm = pn}. Then

A. both R, S are equivalence relations

B. R is an equivalence relation, but not S.

C. S is an equivalence relation, but not R.

D. neither R nor S is an equivalence relation.

Answer: C

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8. If the locus of a point, whose chord of contact with respect to the circle $x^2 + y^2 = 4$ is a tangent to the curve $xy = 1$ is

$xy = c^2$, then the value of c^2 is

A. 2

B. 4

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

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

Answer: B

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9. If the variable line $y = kx + 2h$ is tangent to an ellipse $2x^2 + 3y^2 = 6$, then locus of P(h, k) is a conic C whose eccentricity equals

A. $\frac{\sqrt{5}}{2}$

B. $\frac{\sqrt{7}}{3}$

C. $\frac{\sqrt{7}}{2}$

D. $\sqrt{\frac{7}{3}}$

Answer: D

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10. If y = mx bisect two chords of $y^2 = 4x$ from (4,4), then m can't be

A. $m = \frac{3}{4}$

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

C. $m = \frac{5}{6}$

D. $m = -\frac{1}{2}$

Answer: D

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11. A line $L_1 = \frac{x}{10} + \frac{y}{8} = 1$ intersects the coordinate axes at points A and B. Another line L_2 perpendicular to L_1 intersects the coordinate axes at C and D. The locus of circumcentre of ΔABD is

A. $5x - 4y = 9$

B. $5x - 4y = 18$

C. $4x - 5y = 9$

D. $4x - 5y = 18$

Answer: A

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12. A plane meets the coordinate axes in points A, B, C and the centroid of the triangle ABC is (α, β, γ). The equation of the plane is

A. $\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = 3$

B. $\alpha x + \beta y + \gamma z = 3\alpha\beta\gamma$

C. $\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = \frac{1}{2}$

D. None of these

Answer: A

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13. Let $\alpha \in R$ and the three vectors $\vec{a} = \alpha\hat{i} + \hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \alpha\hat{k}$ and $\vec{c} = \alpha\hat{i} - 2\hat{j} + 3\hat{k}$. Then the set $S = \left\{\alpha : \vec{a}, \vec{b} \text{ and } \vec{c} \text{ are coplanar}\right\}$

A. is singleton

B. Contains exactly two numbers only one of which is positive

C. Contains exactly two positive numbers

D. is empty

Answer: D

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14. If $\lim_{x \to 0} \left(x^{-3} \sin 3x + a x^{-2} + b \right)$ exists and is equal to 0, then

A. $a = -3$ and $b = 9/2$

B. $a = 3$ and $b = 9/2$

C. $a = -3$ and $b = -9/2$

D. $a = 3$ and $b = -9/2$

Answer: A

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15. Consider $f: R^+ \to R$ such that $f(3) = 1$ for $a \in R^+$ and $f(x) \cdot f(y) + f\left(\frac{3}{x}\right) f\left(\frac{3}{y}\right) = 2f(xy) \, \forall x, y \in R^+$ then f(97) can be

A. 1

B. -1

C. 2

D. 97

Answer: A

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16. Let $y(x)$ be a solution of $\frac{(2+\sin x)}{(1+y)}\frac{dy}{dx} = \cos x$ If $y(0) = 2$, then $y\left(\frac{\pi}{2}\right)$ equals

A. $\frac{5}{2}$

B. 2

C. $\frac{7}{2}$

D. 3

Answer: C

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17. $\int \frac{dx}{(x-\beta)\sqrt{(x-\alpha)(\beta-x)}}$ is

A. $\frac{2}{\alpha-\beta}\sqrt{\frac{x-\alpha}{\beta-x}} + c$

B. $\frac{2}{\alpha-\beta}\sqrt{(x-\alpha)(\beta-x)}+c$

C. $\frac{\alpha-\beta}{2}(x-\alpha)\sqrt{\beta-x}$

D. None of these.

Answer: A

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18. If the truth value of p, q and r are F,T and F respectively, then the truth value of

A. $(p \to q) \wedge (q \to r)$ is true (T)

B. $(p \to q) \vee (q \to r)$ is false (F)

C. $(p \to q) \leftrightarrow (q \to r)$ is false (F)

D. $(p \to q) \to (q \to r)$ is true (T)

Answer: C

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19. For a random variable X, $E(X) = 3$ and $E\left(X^2\right) = 11$. Then, variance X is

A. 8

B. 5

C. 2

D. 1

Answer: C

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20. $\lim_{n \to \infty} \sum_{r=1}^{n} \cot^{-1}\left(\frac{r^3 - r + \frac{1}{r}}{2}\right)$ is equal to

A. 0

B. π

C. $\frac{\pi}{2}$

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

Answer: C

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Mathematics Subjective Numerical

1. Let $A = [a_{ij}]_{3 \times 3}$ be a matrix such that $AA^T = 4I$ and $a_{ij} + 2c_{ij} = 0$ (where C_{ij} is the cofactor of a_{ij} and I is the unit

matrix of order 3). If the determinents are related by

$$\begin{vmatrix} a_{11}+4 & a_{12} & a_{13} \\ a_{21} & a_{22}+4 & a_{23} \\ a_{31} & a_{32} & a_{33}+4 \end{vmatrix} + 5\lambda \begin{vmatrix} a_{11}+1 & a_{12} & a_{13} \\ a_{21} & a_{21}+1 & a_{23} \\ a_{31} & a_{32} & a_{33}+1 \end{vmatrix} = 0$$

then $10\lambda =$

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2. The rate at which surface area of the cube increases (in cm^2/ sec), when the volume of a cube is increasing at a rate of 18 cm^3 / sec and edge of the cube is 12cm, is

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3. If $y = 2^{\log_2(x)^{2x}} + \left(\tan\frac{\pi x}{4}\right)^{\frac{4}{\pi x}}$, then the value of $\frac{dy}{dx}$ at $x = 1$ is

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4. The value of the integral $\int_{-10}^{1} \frac{\left|\frac{2[x]}{3x-[x]}\right|}{\frac{2[x]}{3x-[x]}}$, where [.] represents GIF is p/q where p and q are relatively prime then p+q is equal to

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5. Find the area of the region in first quadrant in which points are nearer to the origin then to the line x = 3

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6. Let $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and f is differentiable everywhere on R except at two isolated points, say x_1 and x_2. Then the value of $x_1^2 + x_2^2$ is equal to

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7. Tangents are drawn to the hyperbola $x^2 - 9y^2 = 9$ from (3, 2). Find the area of the triangle that these tangents form with their chord of contact.

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8. If pth, qth and rth terms of a H.P. be respectively a, b and c then prove that $(q-r)bc + (r-p)ca + (p-q)ab = 0$

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9. ABC is a triangular park with AB = AC = 100 metres. A vertical tower is situated at the mid-point of BC. If the angles of elevation of the top of the tower at A and B are $\cot^{-1}\left(3\sqrt{2}\right)$

and $\text{cosec}^{-1}\left(2\sqrt{2}\right)$ respectively, then the height of the tower (in metres) is :

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10. Sum of all solutions in [0, 100] of the equation $\sin \pi x + \cos \pi x = 0$, is

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