MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 103

Mathematics

1. The coefficient of x^4 in the expansion $(1-x)^8(1+x)^{12}$ is equal to

A. 1

B. -48

C. 28

D. -19

Answer: D

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2. For a complex number z, if $arg(z) \in (-\pi, \pi]$, then

$arg\left(1+\cos.\frac{6\pi}{5}+I\sin.\frac{6\pi}{5}\right)$ is (here i^2-1)

A. $\frac{3\pi}{5}$

B. $\frac{2\pi}{5}$

C. $-\frac{2\pi}{5}$

D. $-\frac{3\pi}{5}$

Answer: C

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3. Consider the system of equations

$$x + 2y + 3z = 6,$$

$$4x + 5y + 6z = \lambda,$$

$$7x + 8y + 9z = 24.$$

Then, the value of λ for which the system has infinite solutions is

A. 15

B. 20

C. 16

D. 30

Answer: A

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4. Tibu and Babu are playing a game in which both the players roll a pair of dice. Tibu wins if the sum of the numbers appearing on the dice is a prime number while Babu wins if the product of the numbers appearing on the dice is prime. The chance that no one wins is (both players are allowed to win simultaneously)

A. $\frac{19}{36}$

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

C. $\frac{17}{36}$

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

Answer: C

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5. Let α, β and γ be the roots of equation $x^3 + x + 1 = 0$, then

$$\frac{\alpha\beta(\alpha+\beta)+\beta\gamma(\beta+\gamma)+\gamma\alpha(\gamma+\alpha)}{\alpha^2+\beta^2+\gamma^2}$$ is

equal to

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

B. 1

C. -3

D. $-\frac{3}{2}$

Answer: D

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6. Let l, m and n are three distinct numbers in arithmetic progression. Also l^2, m^2 and n^2 are in geometric prgression and $l + m + n = 3$. If $l < m < n$, then n is equal to

A. 1

B. $1 - \sqrt{2}$

C. $1 + \sqrt{2}$

D. $2 + \sqrt{5}$

Answer: C

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7. The equation of incircle of the triangle formed by common tangents to the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 6x + 8 = 0$ is

A. $x^2 + y^2 = 1$

B. $x^2 + y^2 - 6x + 8 = 0$

C. $x^2 + y^2 - 6x + 9 = 0$

D. $x^2 - y^2 = 1$

Answer: B

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8. The tangent to the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ at point P lying in the first quadrant meets x - axis at Q and y - axis at R. If the length QR is minimum, then the equation of this tangent is

A. $2x + \sqrt{5}y = 6\sqrt{5}$

B. $\sqrt{4}x + 2y = 6\sqrt{5}$

C. $2x - \sqrt{5} = 6\sqrt{5}$

D. $2\sqrt{5}x + y = 6\sqrt{5}$

Answer: A

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9. Let the tangents to the parabola $y^2 = 4ax$ drawn from point P have slope m_1 and m_2. If $m_1 m_2 = 2$, then the locus of point P is

A. $x = a$

B. $x = \frac{a}{2}$

C. $x + a = 0$

D. $x = 2a$

Answer: B

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10. In the triangle ABC, vertices A, B, C are $(1, 2), (3, 1), (-1, 6)$ respectively. If the internal angle bisector of $\angle BAC$ meets BC at D, then the coordinates of D are $\left(\frac{5}{3}, \frac{8}{3}\right)$

A. $\left(1, \frac{7}{2}\right)$

B. $\left(\frac{1}{3}, \frac{13}{3}\right)$

C. $\left(2, \frac{3}{4}\right)$

D. $\left(2, \frac{3}{4}\right)$

Answer: A

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11. The image of the line $\frac{x-2}{2} = \frac{y-3}{-3} = \frac{z-4}{1}$ in the plane $x + y + z = 6$ can be

A. $\vec{r} = \lambda\left(2\hat{i} - 3\hat{j} + \hat{k}\right)$

B. $\vec{r} = \left(2\hat{i} + \hat{j} + \hat{k}\right) + \alpha\left(2\hat{i} - 3\hat{j} + \hat{k}\right)$

C. $\vec{r} = \left(\hat{j} + 2\hat{k}\right) + \beta\left(2\hat{i} - 3\hat{j} + \hat{k}\right)$

D. $\vec{r} = \left(\hat{i} + 2\hat{j}\right) + u\left(2\hat{i} - 3\hat{j} + \hat{k}\right)$

Answer: C

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12. Let $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$. If $\vec{c}$ is a non - zero vector perpendicular to both $\vec{a}$ and $\vec{b}$, such that its component along x, y, z axes are rational numbers, then $\left|\vec{c}\right|$ is

A. an integer

B. an irrational number

C. a rational number

D. None of these

Answer: B

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13. Let

$f: R \to R, f(x) = x^4 - 8x^3 + 22x^2 - 24x + c$

.

If sum of all extremum value of f(x) is 1, then c is equal to

A. 8

B. 9

C. 10

D. 11

Answer: B

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14. If $f(x)$ is a continuous function such that its value $\forall x \in R$ is a rational number and $f(1) + f(2) = 6$, then the value of $f(3)$ is equal to

A. 3

B. 9

C. 2

D. 4

Answer: A

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15. The domain of the function $f(x) = \sqrt{(x^2 - 8x + 12).\ln^2(x-3)}$ is

A. $[3, \infty)$

B. $[4, \infty)$

C. $[6, \infty) \cup \{2, 4\}$

D. $[6, \infty) \cup \{4\}$

Answer: D

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16. The area bounded by $y = \sqrt{1 - x^2}$ and $y = x^3 - x$ is divided by y - axis in the ratio $\lambda : 1 (\forall \lambda > 1)$, then λ is equal to

A. $\frac{\pi + 1}{\pi - 1}$

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

C. $\frac{\pi + 1}{\pi}$

D. $\frac{\pi + 2}{\pi - 2}$

Answer: A

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17. The straight line $y = 2x$ meets $y = f(x)$ at P, where f(x) is a solution of the differential equation $\frac{dy}{dx} = \frac{x^2 + xy}{x^2 + y^2}$ such that $f(1) = 3$, then $f'(x)$ at point P is

A. $\frac{3}{5}$

B. $\frac{5}{3}$

C. 2

D. 1

Answer: A

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18. If $\int \frac{2x^2+5}{x^2+a}dx = f(x)$, where f(x) is a polynomial or ratio of polynomials, then the number of possible value(s) of a is equal to

A. 0

B. 1

C. 2

D. 3

Answer: C

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19. Negation of the statement, "I will work hard and pary" is

A. I will not work hard and party

B. I will not work hard or I will party

C. I will not work hard or I will not party

D. I will not work had and I will not party

Answer: C

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20. The solution set of the inequality $\left(\tan^{-1} x\right)^2 \leq \left(\tan^{-1} x\right) + 6$ is

A. $[-\tan 2, \tan 3]$

B. $[\tan 2, -\tan 3]$

C. $[\tan 2, \tan 3]$

D. $(-\infty, \infty)$

Answer: A

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21. Let the matrix $A = \begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$ and $B = A + A^2 + A^3 + A^4$. If $B = \lambda A$, $\forall \lambda \in R$, then the vlaue of λ is equal to

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22. The number of solution of the equation $2a + 3b + 6c = 60$, where $a, b, c \in N$, is equal to

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23. The value of the integral $\int_0^8 \frac{x^2}{x^2 + 8x + 32} dx$ is equal to

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24. A person standing at point P sees angle of elevation of the top of a building, whose base is 50 meters away, to be 60°. Another building whose base is 20 meters away from the base of the first building and is between the observer and first building has height h meters, then the maximum possible height (in meters) of this second building is $(\text{Take } \sqrt{3} = 1.73)$

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25. The number of solutions of the equation

$\cot x \cos x - 1 = \cot x - \cos x, \forall \in [0, 2\pi]$

is equal to

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