MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 107

Mathematics

1. The coefficient of x^{48} in the expansion of $\left(1+x^{4}\right)\left(1+x^{24}\right)\left(1+x^{48}\right)$ is

A. $^{12}C_{6}+3$

B. $^{12}C_{6}$

C. 1

D. $^{12}C_6 + 2$

Answer: C

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2. If $i^2 - 1$ and $\Sigma_{r=1}^{n}(i)^r \forall n \in N$, is a non - zero real number, then n can be

A. 100

B. 201

C. 302

D. 403

Answer: D

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3. If $P = \begin{bmatrix} \lambda & 0 \\ 7 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} 4 & 0 \\ -7 & 1 \end{bmatrix}$ such that $P^2 = Q$, then P^3 is equal to

A. $\begin{bmatrix} -8 & 0 \\ 21 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 10 & 1 \\ 8 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 0 \\ 8 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 6 & 0 \\ 4 & 1 \end{bmatrix}$

Answer: A

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4. The system of equations $x + py = 0, y + pz = 0$ and $z + px = 0$ has infinitely many solutions for

A. $p = 1$

B. $p = 0$

C. $p = -1$

D. no real value of p

Answer: C

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5. The value of the integral $\int_0^1 \left\{4t^3(1+t)^8 + 8t^4(1+t)^7\right\}dt$ is

A. 128

B. 512

C. 256

D. 1024

Answer: C

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6. The focal chords of the parabola $y^2 = 16x$ which are tangent to the circle of radius r and centre (6, 0) are

perpendicular, then the radius r of the circle is

A. units

B. $\sqrt{2}$ units

C. 1 units

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

Answer: B

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7. The equation of the circumcricle of the $x^2 - 8x + 12 = 0$ and $y^2 - 14y + 45 = 0$ is

A. $x^2 + y^2 - 4x - 7y + 57 = 0$

B. $x^2 + y^2 - 8x - 14y + 57 = 0$

C. $x^2 + y^2 - 8x - |14y + 5| = 0$

D. $2x^2 + y^2 - 8x - 14y + 57 = 0$

Answer: B

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8. Let A, B, C be three events and $\overline{A}, \overline{B}, \overline{C}$ be their corresponding complementary event. If the probabilities of events $B, A \cap B \cap \overline{C}$ and $\overline{A} \cap B \cap \overline{C}$ are $\frac{5}{6}, \frac{1}{2}$ and $\frac{1}{4}$ respectively, then the probability of the event $B \cap C$ is

A. $\frac{1}{12}$

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

C. $\frac{1}{6}$

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

Answer: A

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9. The area (in sq. units) of the region in the first quadrant bounded by $y = x^2$, $y = 2x + 3$ and the y - axis is

A. $2\sqrt{3}$

B. 6

C. 9

D. $\frac{44}{3}$

Answer: C

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10. If the line $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-q}{p}$ lies completely in the plane $2x - 4y + z = 7$, then the ordered pair (p, q) is

A. (2, 7)

B. (7, 2)

C. (2, 4)

D. (1, 1)

Answer: A

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11. Which of the following statement is converse of the statement "if if rains then we will party"?

A. We will party or it rains

B. It rains or we will party

C. We will not party or it rains

D. We will not party or it does not rain

Answer: C

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12. Let y(x) is the solution of the differential equation $(x+2)\frac{dy}{dx} - (x+1)y = 2$. If $y(0) = -1$, then the value of $y(2)$ is equal to

A. $e^2 + \frac{1}{2}$

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

C. $\frac{1}{2} - e^2$

D. e^2

Answer: B

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13. For a differentiable function $f(x)$, if $f'(2) = 2$ and $f'(3) = 1$, then the value of $\lim_{x \to 0} \frac{f(x^2 + x + 2) - f(2)}{f(x^2 - x + 3) - f(3)}$ is equal to

A. 2

B. 1

C. -2

D. -1

Answer: C

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14. For $p > 2$ and $x \in R$, if the number of natural numbers in the range of $f(x) = \frac{x^2 + 2x + p}{x^2 + 2x + 2}$ is 3, then the value of p is equal to

A. 3

B. 4

C. 5

D. 6

Answer: C

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15. Let $\vec{V_1} = \hat{i} + a\hat{j} + \hat{k}, \vec{V_2} = \hat{j} + a\hat{k}$ and $\vec{V_3} = a\hat{i} + \hat{k}, \forall a > 0$. If $\left[\vec{V_1} \quad \vec{V_2} \quad \vec{V_3}\right]$ is minimum, then the value of a is

A. $\sqrt{3}$

B. 3

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

D. $\frac{1}{\sqrt{3}}$

Answer: D

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16. The orthocentre of the triangle whose vertices are $(1, 1), (5, 1)$ and $(4, 5)$ is

A. $\left(\frac{9}{4}, -\frac{1}{3}\right)$

B. $(4, 13)$

C. $\left(4, \frac{9}{4}\right)$

D. $\left(4, \frac{7}{4}\right)$

Answer: D

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17. Let $a \in \left(0, \frac{\pi}{2}\right)$ and $f(x) = \sqrt{x^2 + x} + \frac{\tan^2 \alpha}{\sqrt{x^2 + x}}, x > 0$. If the least value of

$f(x)$ is $2\sqrt{3}$, then α is equal to

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

B. $\frac{\pi}{8}$

C. $\frac{\pi}{6}$

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

Answer: A

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18. A normal is drawn to the ellipse $\frac{x^2}{9} + y^2 = 1$ at the point $(3\cos\theta, \sin\theta)$ where $0 < \theta < \frac{\pi}{2}$. If N is the foot of the perpendicular from the origin O to the normal such that ON = 2, then θ is equal to

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

B. $\frac{\pi}{12}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: D

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19. The natural domain of the function $f(x) = \sqrt{\sin^{-1}(2x) + \frac{\pi}{3}}$ is

A. $\left[-\frac{1}{2}, \frac{1}{2}\right]$

B. $\left[-\frac{\sqrt{3}}{4}, \frac{1}{2}\right]$

C. $\left[\frac{13}{4}, \frac{1}{2}\right]$

D. $\left[-\frac{\sqrt{3}}{2}, 1\right]$

Answer: B

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20. In the interval $[0, 2]$, on which of the following function Lagrange's mean value theorem is not applicable ?

A. $f(x) = \begin{cases} \frac{\sin x}{x} & x \neq 0 \\ 1 & x = 0 \end{cases}$

B. $f(x) = \begin{cases} 1 - x & x < 1 \\ (1 - x)^2 & x \geq 1 \end{cases}$

C. $f(x) = x^2|x|$

D. $f(x) = |e^x - 1|$

Answer: B

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21. The number of ways three different natural numbers cab be drawn from the set $\{1, 2, 3, 4, \ldots\ldots\ldots\ldots, 10\}$, if minimum of the chosen numbers is smaller than 4, is

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22. Let $f(x) = x^2 + 2px + 2q^2$ and $g(x) = -x^2 - 2px + p^2$ (where $q \neq 0$). If $x \in R$ and the minimum value of $f(x)$ is

equal to the maximum value of $g(x)$, then the value of $\frac{p^2}{q^2}$ is equal to

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23. If $\int \frac{dx}{(x+1)^2(x^2+2x+2)} = \frac{A}{x+1} + B\tan^{-1}(x+1) + C$, where A and B are constants and C is the constant of integration, then $|A-B|$ is equal to

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24. The number of solutions of the equation $\sin x . \sin 2x . \sin 3x . \sin 4x . \sin 5x = 0$ in $[0, \pi]$ is equal to

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25. A balloon is rising vertically upwards. An an instant, an observation on the ground, whose distance from the balloon is 100 meters, sees the balloon at an angle of elevation of 30°. If the balloon rises further vertically to a point where the angle of elevation as seen by the observer is 45°, then its height (in meters) from the ground is $\left(\text{Take } \sqrt{3} = 1.73\right)$

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