MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 84

Mathematics

1. The constant term in the expansion of:

$\left(2+5x+ax^3\right)\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^9$ is 1. The value of a is:

A. 3

B. 4

C. 5

D. -6

Answer: D

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2. Which of the following statements has a truth value of F

A. A quadratic equation has always a real root

B. The number of ways of seating 2 persons in two chairs out of n persons is ${}^{n}P_{2}$

C. The cube roots of unity are in G. P.

D. Two plus three equals five

Answer: A

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3. Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $(10)B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$, If B is the inverse of matrix A, then α is:

A. 5

B. -1

C. 2

D. -2

Answer: A

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4. If [x] denotes the greatest integer less than or equal to x, then the value of the determinant

$$\begin{bmatrix} e & \pi & \pi^2 - 6 \\ \pi & \pi^2 - 6 & e \\ \pi^2 - 6 & e & \pi \end{bmatrix}$$ is

A. -8

B. 8

C. 0

D. none of these

Answer: A

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5. if two points P and Q lie on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1(a < b)$, whose centre C be such that CP is perpendicular to CQ, then the value of $\frac{1}{CP^2} + \frac{1}{CQ^2}$ is:

A. $\frac{b^2 - a^2}{2ab}$

B. $\frac{1}{a^2} + \frac{1}{b^2}$

C. $\frac{2ab}{b^2 - a^2}$

D. $\frac{1}{a^2} = \frac{1}{b^2}$

Answer: D

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6. If $x^2 + x + y^2 - 1 = 0$, where $x > 0$ and $y > 0$, then maximum value of $x\sqrt{y}$ is:

A. $\frac{1}{3\sqrt{2}}$

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

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: B

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7. Plane is parallel to the vectors $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{k}$ and another plane is parallel to $\hat{i}+\hat{j}$ and $\hat{i}-\hat{j}$ then the acute angle between $4\hat{i}-\hat{j}$ and the line of intersection of the two planes is:

A. $\frac{\cos^{-1}1}{\sqrt{2}}$

B. $\frac{\cos^{-1} 3}{\sqrt{34}}$

C. $\frac{\cos^{-1} 2}{\sqrt{34}}$

D. $\frac{\cos^{-1} 5}{\sqrt{34}}$

Answer: B

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8. Let a and c are unit vectors and |b| = 4 with $a \times b = 2a \times c$. The angle between a and c is $\frac{\cos^{-1} 1}{4}$. If $b - 2c = \lambda$, then λ is equal to

A. $1/3, 1/2$

B. $2/3, 1/3$

C. $3, -4$

D. 2,3

Answer: C

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9. If $|z_1 + z_2|^2 = |z_1 - z_2|^2$, where z_1 and z_2 are non-zero complex numbers, then

A. $Re\left(\frac{z_1}{z_2}\right) = 0$

B. $I_m = \left(\frac{z_1}{z_2}\right) = 0$

C. $Re(z_1 + z_2) = 0$

D. none of these

Answer: A

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10. Let f(x) is a function, defined as:

$$f(x) = \begin{cases} 3x^2 + 2x + 5 & x > 0 \\ 4 & x = 0, \\ x^2 - 4x + 3 & x < 0 \end{cases}$$

then

$$\lim_{x \to 0^+} f(\{x - \sin x\})$$

equals [Note: {•} denotes fractional part function.]

A. 3

B. 4

C. 5

D. None

Answer: C

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11. The set of points where $f(x) = (x-1)^2(x+|x-1|)$ is thrice differentiate, is:

A. R

B. R-{0}

C. R-{1}

D. R-{0,1}

Answer: C

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12. A parabola $y = ax^2 + bx + c$ crosses the x -axis at $(\alpha, 0), (\beta, 0)$ both to the right of the origin. A circle also passes through these 2 points. The length of tangent from the origin to the circle is:

A. $\sqrt{\frac{bc}{a}}$

B. ac^2

C. $\frac{b}{a}$

D. $\sqrt{\frac{c}{a}}$

Answer: D

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13. The value of $\left(\frac{\cos\pi}{30}\cdot\frac{\cos(3\pi)}{10}\cdot\frac{\cos(11\pi)}{30}\right)^2$ is equal to $+\left(\frac{\sin\pi}{30}\cdot\frac{\sin(3\pi)}{10}\cdot\frac{\sin(11\pi)}{30}\right)^2$

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

B. 1

C. $\frac{1}{16}$

D. $\frac{1}{64}$

Answer: C

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14. The area enclosed by the curves given by $y = \sqrt{5 - x^2}$ and $y = |x - 1|$ is_____

A. $\left(\frac{4\pi}{42}\right)$ sq. unit

B. $\frac{(5\pi) - 1}{4}$ sq. unit

C. $\left(\frac{5\pi - 2}{4}\right)$ sq. unit

D. $\left(\frac{5\pi}{2} - 5\right)$ sq. unit

Answer: C

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15. If $\cot\left(\frac{\pi}{3}\cos 2\pi x\right) = \sqrt{3}$, then the general solution of the equation is:

A. $x = n \pm \frac{1}{2}, (n \in I)$

B. $x = n \pm \frac{1}{3}, (n \in I)$

C. $x = n \pm \frac{1}{6}, (n \in I)$

D. $x = n \pm \frac{1}{4}, (n \in I)$

Answer: C

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16. The derivative of $\tan^{-1}\left[\frac{3x^2-1}{3x-x^3}\right]$ with respect to $\sin^{-1}\left[\frac{x^2-1}{x^2+1}\right]$ is:

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

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

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

D. $-\frac{3}{23}$

Answer: C

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17. The mean of the two-digit numbers which remains same when the digits interchange their positions is:

A. 33

B. 44

C. 55

D. 66

Answer: C

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18. The equation of two sides of a triangle are $3x + 4y - 12 = 0, 2, x + y - 8 = 0$. If the circumcentre is (0, 3), then the centroid of the triangle is:

A. $\left(0, \frac{7}{3}\right)$

B. $\left(0, \frac{14}{3}\right)$

C. $\left(0, \frac{16}{3}\right)$

D. $(0, 6)$

Answer: B

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19. The curve such that the Intercept on the x-axis cut-off between the origin, and the tangent at a point is twice the abscissa and passes through the point (2,3) is:

A. xy =2

B. xy=3

C. xy=6

D. xy=1

Answer: C

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20. Let $A = [x : x \in R, |x| < 1], B$ and $A \cup B = R - D = [x : x \in R, |x - 1| \geq 1]$ then the set D is:

A. $[x : 1 < x \leq 2]$

B. $[x : 1 \leq x < 2]$

C. $[x : 1 \leq x \leq 2]$

D. None of these

Answer: B

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21. If y = a sin 3x + 6 cos 3x satisfies $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = 10\cos 3x$

then find the value of 3 (a + 6).

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22. A circle has same centre as an ellipse and passes through the Foci F_1 and F_2 of the ellipse, such that the 2 curves intersect in 4 points. Let P be any of their point of intersection. If the major axis of the ellipse is 15 and the area of the triangle PF_1F_2 is $\frac{81}{4}$, then the distance between the foci is k then $\left(\frac{k}{3}\right)$ is:

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23. The number of pairs of diagonals of a regular polygon of 10 sides that are parallel, are:

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24. If $f(x) = \frac{ax+b}{bx-a}, x \neq \frac{a}{b}, a > 0, b > 0$ and if $g(x) = f(f(x)) + f\left(f\left(\frac{1}{x}\right)\right)$ and

$g: [1, \infty] \to [2, \infty)$, then the value of x for which $g(x) = \frac{5}{2}$, is:

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25. If the line y = mx + c is tangent to the circle $x^2 + y^2 = 5r^2$ and the parabola $y^2 - 4x - 2y + 4\lambda + 1 = 0$ and point of contact of the tangent with the parabola is (8,5), then find the value of $(25r^2 + \lambda + 2m - c)$

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26. Let a fair coin be tossed 6 times. A, B and C three events are defined as

A : exactly 4 heads are obtained.

B : 4th head obtained on 5th toss.

C : tail is obtained, on 2nd or 4th toss

If conditional probability, $P\left(\frac{B}{A \cap C}\right) = \frac{m}{n}$, where $m, n \in N$ then find the least value of (n - m)

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27. If the range of values of V for which $f(x) = \log_a\left(4ax - x^2\right)$ is strictly increasing $\forall x \in \left[\frac{3}{2}, 2\right]$ is $(p, q] \cup (r, \infty)$ then the value of (2p + 4q + r) equals

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28. If $I_1 = \int_0^i \sqrt{1 - \sin 2x}\,dx$ and $I_2 = \int_0^\pi \sqrt{1 + \sin 2x}\,dx$ then the value of $I_1 . I_2$ =

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29. If $\int \frac{\cos^4 x + \sin^4 x}{\cos^6 x + \sin^6 x} dx = f(x) + c$, where $f(0) = 0$ then the value of $\left(\frac{4}{\pi} f\left(\frac{\pi}{4}\right)\right)$ is.....

(where c is constant of integration)

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