



## MATHS

### BOOKS - NTA MOCK TESTS

#### NTA JEE MOCK TEST 87

#### Mathematics

1. In the expansion of  $\left(3\sqrt{\frac{a}{b}} + 3\sqrt{\frac{b}{\sqrt{a}}}\right)^{21}$ , the term

containing same powers of a & b is

A. 11<sup>th</sup>

B. 13<sup>th</sup>

C.  $12^{\text{th}}$

D.  $6^{\text{th}}$

**Answer: B**



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2. The least value of  $n(n \in N)$ , such that the function

$f(n, x) = \int n \cos(nx) dx$  satisfies  $f\left(n, \frac{\pi}{2}\right) = -1$ , is

(given,  $f(n, 0) = 0$ )

A. 3

B. 4

C. 5

D. 6

**Answer: A**



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**3.** Find the set of all possible real value of  $a$  such that the inequality  $(x - (a - 1))(x - (a^2 + 2)) < 0$  holds for all  $x \in (-1, 3)$ .

A.  $(1, \infty)$

B.  $(-\infty, -1)$

C.  $(-\infty, 1)$

D.  $(0, 1)$

**Answer: B**



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4. The area (in sq. units) of the circle touching the line  $x + y = 4$  at  $(1, 3)$  and intersecting  $x^2 + y^2 = 4$  orthogonally is equal to

A.  $\frac{9\pi}{8}$

B.  $\frac{7\pi}{8}$

C.  $\frac{5\pi}{4}$

D.  $\frac{4\pi}{3}$

**Answer: A**



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5. Consider a function  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = x^3 + 4x + 5$ , then

- A.  $f$  is one - one but not onto
- B.  $f$  is onto but not one - one
- C.  $f$  is one - one and onto
- D.  $f$  is neither one - one nor onto

**Answer: C**



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6. Let  $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & a & 1 \\ 4 & b & 3 \end{bmatrix}$  and  $A = A^{-1}$ , then

$a + 2b$  is equal to

A. 0

B. 4

C. 8

D. 5

**Answer: C**



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7. An unbiased die is rolled  $n$  times. Let  $P(A)$ ,  $P(B)$  and  $P(C)$  be the probability of occurrence of an odd number exactly one, two and three times respectively in  $n$  trials. If  $P(A)$ ,  $P(B)$ ,  $P(C)$  are in arithmetic progression, then  $n$  is equal to

A. 4

B. 5

C. 6

D. 7

**Answer: D**



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8. Let  $A = [a_{ij}]_{3 \times 3}$  be a square matrix such that  $AA^T = 4I, |A| < 0$ . If

$$\begin{vmatrix} a_{11} + 4 & a_{12} & a_{13} \\ a_{21} & a_{22} + 4 & a_{23} \\ a_{31} & a_{32} & a_{33} + 4 \end{vmatrix} = 5\lambda|A + I|. \text{ Then } \lambda \text{ is}$$

equal to

A.  $\frac{4}{5}$

B.  $-\frac{4}{5}$

C.  $\frac{8}{5}$

D.  $-\frac{8}{5}$

**Answer: D**



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9. If the lines  $\frac{x-3}{2} = \frac{y-5}{2} = \frac{z-4}{\lambda}$  and  $\frac{x-2}{\lambda} = \frac{y-6}{4} = \frac{z-5}{2}$

intersect at a point  $(\alpha, \beta, \gamma)$ , then the greatest value of  $\lambda$  is equal to

- A. 0
- B. 2
- C. -2
- D. 4

**Answer: A**



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10. Let  $f: (-1, 1) \rightarrow \mathbb{R}$  be a function defined by  $f(x) = \max\{-|x|, -\sqrt{1-x^2}\}$ . If  $K$  is the set of all points at which  $f$  is not differentiable, then  $K$  has set of all points at which  $f$  is not differentiable, then  $K$  has exactly

- A. one element
- B. two elements
- C. five elements
- D. three elements

**Answer: C**



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11. Number of ordered pairs  $(a, x)$  satisfying the equation

$$\sec^2(a + 2)x + a^2 - 1 = 0; \quad -\pi < x < \pi \text{ is}$$

A. 1

B. 2

C. 3

D. 4

**Answer: C**



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12. Which of the following option is incorrect?

A.  $\sim(p \Leftrightarrow \sim q) \equiv p \Leftrightarrow q$

B.  $\sim(p \Leftrightarrow q) \equiv (p \rightarrow \sim q) \wedge (\sim q \rightarrow p)$

C.  $\sim(p \Leftrightarrow q) \equiv \sim p \Rightarrow q$

D.  $\sim(p \Rightarrow q) \equiv p \wedge \sim q$

**Answer: C**



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13. The value of  $2 \cos^{-1} \sqrt{\frac{2}{3}} - 2 \cos^{-1} \frac{\sqrt{6} + 1}{2\sqrt{3}}$  is equal to

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

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

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

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

**Answer: A**



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**14.** If a tangent drawn at  $P(\alpha, \alpha^3)$  to the curve  $y = x^3$  meets it again at  $Q(\beta, \beta^3)$ , then  $2\beta + \alpha$  is equal to

A. 0

B.  $-3\alpha$

C.  $3\alpha$

D.  $4\alpha$

**Answer: B**



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15. The slope of normal at any point P of a curve (lying in the first quadrant) is reciprocal of twice the product of the abscissa and the ordinate of point P. Then, the equation of the curve is (where,  $c$  is an arbitrary constant)

A.  $y^2 = x + c$

B.  $y = ce^{-x^2}$

C.  $y = ce^{-x}$

D.  $y^2 = \ln x + c$

**Answer: B**



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**16.** A shopkeeper has 11 copies each of nine different books, then the number of ways in which atleast one book can be selected is

A.  $9^{11} - 1$

B.  $10^{10} - 1$

C.  $11^9 - 1$

D.  $10^9$

**Answer: C**



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17. Let  $|z_1| = 3$ ,  $|z_2| = 2$  and  $z_1 + z_2 + z_3 = 3 + 4i$ . If the real part of  $(z_1\bar{z}_2 + z_2\bar{z}_3 + z_3\bar{z}_1)$  is equal to 4, then  $|z_3|$  is equal to (where,  $i^2 = -1$ )

A. 1

B. 2

C. 3

D. 4

**Answer: B**



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18. From a point P, two tangents PA and PB are drawn to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ . If the product of the slopes of these tangents is 1, then the locus of P is a conic whose eccentricity is equal to

A. 1

B. 2

C.  $\sqrt{2}$

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

**Answer: C**



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19. If  $\sin 2A = \frac{1}{2}$  and  $\sin 2B = -\frac{1}{2}$ , then which of the following is false?

A.  $\sin(A + B)$  may be 0

B.  $\cos(A - B)$  may be 0

C.  $\sin(A + B)$  or  $\cos(A - B)$  is zero

D.  $\sin(A + B) = 0$

**Answer: D**



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20. Let B and C are the points of intersection of the parabola  $x = y^2$  and the circle  $y^2 + (x - 2)^2 = 8$ . The

perimeter (in units) of the triangle OBC, where O is the origin, is

A. 8

B.  $4\sqrt{5}$

C.  $4\sqrt{5} + 2$

D.  $4(\sqrt{5} + 1)$

**Answer: D**

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21. If the tenth term of the sequence  $S = 1 + 5 + 13 + 29 + \dots$  is  $k$ , then  $\frac{k}{500}$  is equal to

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22. In a  $\Delta ABC$ , the sides BC, CA and AB are consecutive positive integers in increasing order. Let  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  are position vectors of the vertices A, B and C respectively. If  $(\vec{c} - \vec{a}) \cdot (\vec{b} - \vec{c}) = 0$ , then the value of  $\left| \vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} \right|$  is equal to

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23. The value of  $\lim_{x \rightarrow \frac{5\pi}{4}} \frac{\cot^3 x - \tan x}{\cos\left(x - \frac{5\pi}{4}\right)}$  is equal to

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24. The area bounded by  $f(x) = \begin{cases} \sin(2x) & x \geq 0 \\ \cos(2x) & x < 0 \end{cases}$  with the  $x$  - axis,  $x = -\frac{\pi}{4}$  and  $x = \frac{\pi}{4}$  is  $k$  square units. Then, the value of  $4k$  is equal to



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25. Let in  $\triangle ABC$  the coordinates of A are  $(0, 0)$ . Internal angle bisector of  $\angle ABC$  is  $x - y + 1 = 0$  and mid - point of BC is  $(-1, 3)$ . Then, the ordinate of C is



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