



## MATHS

### BOOKS - NTA MOCK TESTS

#### NTA JEE MOCK TEST 47

#### Mathematics

1. If  $A = \begin{bmatrix} 3 & -2 \\ 7 & -5 \end{bmatrix}$ , then the value of  $|-3A^{2019} + A^{2020}|$  is equal to

A.  $-14$

B.  $28$

C.  $14$

D.  $2^{2019} \cdot 14$

**Answer: A**



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2. Let  $\vec{a}$  be a vector in the  $xy$  - plane making an angle of  $60^\circ$  with the positive  $x$  - axis and  $|\vec{a} - \hat{i}|$  is the geometric mean of  $|\vec{a}|$  and  $|\vec{a} - 2\hat{i}|$ , then the value of  $|\vec{a}|$  is equal to

- A.  $\sqrt{2}$
- B.  $\sqrt{2} + 1$
- C.  $\sqrt{2} - 1$
- D. 2

**Answer: C**

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3. If three normals are drawn from the point  $(c, 0)$  to the parabola  $y^2 = 4x$  and two of which are perpendicular, then the value of  $c$  is equal to

A. 3

B. 4

C. 5

D. 6

**Answer: A**



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4. If the number of ways of selecting 3 numbers out of  $1, 2, 3, \dots, 2n + 1$  such that they are in arithmetic progression is 441, then the sum of the divisors of  $n$  is equal to

A. 21

B. 32

C. 45

D. 60

**Answer: B**



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5. If  $\cos 5\theta = 5 \cos \theta - 2\theta \cos^3 \theta + a \cos^5 \theta + b$ , then the value of  $a + b$  is equal to

A. 20

B. 16

C. -16

D. 15

**Answer: B**



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6. If  $x = \sin(2 \tan^{-1} 3)$  and  $y = \sin\left(\frac{1}{2} \tan^{-1}\left(\frac{4}{3}\right)\right)$ , then

A.  $2x = 1 - y$

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

C.  $x^2 = 1 + y$

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

**Answer: D**

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7. A tower subtends an angle of  $60^\circ$  at a point on the same level as the foot of the tower and at a second point just 10 meters above the first point the angle of depression of the foot of the tower is  $15^\circ$ . The height of the tower is (in meters)

A.  $\frac{10}{\sqrt{3}}(2 - \sqrt{3})$

B.  $10\sqrt{3}(2 - \sqrt{3})$

C.  $\frac{10}{\sqrt{3}}(2 + \sqrt{3})$

D.  $10\sqrt{3}(2 + \sqrt{3})$

**Answer: D**



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8. The function  $f: (-\infty, 1] \rightarrow (0, e^5]$  defined as  $f(x) = e^{x^3+2}$  is

- A. Many one and onto
- B. Many one and into
- C. one - one and onto
- D. one - one and into

**Answer: B**



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9. The function  $f(x) = \lim_{n \rightarrow \infty} \frac{(x-2)^{2n} - 1}{(x-2)^{2n} + 1} (\forall n \in \mathbb{N})$  is discontinuous at

A.  $x = 1$  only

B.  $x = 3$  only

C.  $x = 1$  and 3

D.  $x = 0, 1$  and 2

**Answer: C**



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**10.** If  $a$  and  $b$  are positive integers such that  $N = (a + ib)^3 - 107i$  (where  $N$  is a natural number), then the value of  $a$  is equal to (where  $i^2 = -1$ )

A. 4

B. 5

C. 6

D. 9

**Answer: C**



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11. The area (in sq. units) bounded by the curve  $y = \begin{cases} x, & x \in [0, 1] \\ 2 - x, & x \in [1, 2] \end{cases}$  with the x - axis from  $x = 0$  to  $x = 2$  is

A. 2

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

C. 1

D. 4

**Answer: C**



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12. Let a variable line passing through a fixed point P in the first quadrant cuts the positive coordinate axes at points A and B respectively. If the area of  $\Delta OAB$  is minimum, then OP is

- A. Altitude through vertex O of  $\Delta AOB$
- B. Median through vertex O of  $\Delta AOB$
- C. Internal angle bisector through vertex O of  $\Delta AOB$
- D. None of these

**Answer: B**



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13. A differentiable function  $f(x)$  satisfies  $f(0) = 0$  and  $f(1) = \sin 1$ , then (where  $f'$  represents derivative of  $f$ )

- A.  $f'(c) = \cos c, \forall c \in [0, 1]$
- B.  $f'(c) = \cos c$  for some  $c \in [0, 1]$

C.  $f'(c) = -\cos c, \forall c \in [0, 1]$

D.  $f'(c) = 2 \cos c, \forall c \in [0, 1]$

**Answer: B**



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14. If  $I = \int \frac{dx}{x^3(x^8 + 1)^{3/4}} = \frac{\lambda(1 + x^8)^{1/4}}{x^2} + c$  (where  $c$  is the constant

of integration), then the value of  $\lambda$  is equal to

A. 2

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

C. -2

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

**Answer: D**



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15. The order of the differential equation of the family of parabolas symmetric about  $y = 1$  and tangent to  $x = 2$  is

A. 2

B. 1

C. 3

D. 4

**Answer: B**



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16. The harmonic mean of two positive numbers  $a$  and  $b$  is 4, their arithmetic mean is  $A$  and the geometric mean is  $G$ . If  $2A + G^2 = 27$ ,  $a + b = \alpha$  and  $|a - b| = \beta$ , then the value of  $\frac{\alpha}{\beta}$  is equal to

A. 1

B. 3

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

D. 5

**Answer: B**



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17. The shortest distance between the lines  $\frac{x-2}{2} = \frac{y-3}{2} = \frac{z-0}{1}$  and  $\frac{x+4}{-1} = \frac{y-7}{8} = \frac{z-5}{4}$  lies in the interval

A.  $[0, 1)$

B.  $[1, 2)$

C.  $(2, 3]$

D.  $(3, 4]$

**Answer: C**



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18.

If

$$x^{2a}y^{3b} = e^{5m}, x^{3c}y^{4d} = e^{2n}, \Delta_1 = \begin{vmatrix} 5m & 3b \\ 2n & 4d \end{vmatrix}, \Delta_2 = \begin{vmatrix} 2a & 5m \\ 3c & 2n \end{vmatrix} \text{ and } \Delta_3 =$$

, then the values of x and y are

A.  $\frac{\Delta_1}{\Delta_3}, \frac{\Delta_2}{\Delta_3}$

B.  $\frac{\Delta_2}{\Delta_1}, \frac{\Delta_3}{\Delta_1}$

C.  $\log\left(\frac{\Delta_1}{\Delta_3}\right), \log\left(\frac{\Delta_2}{\Delta_3}\right)$

D.  $e^{\frac{\Delta_1}{\Delta_3}}, e^{\frac{\Delta_2}{\Delta_3}}$

Answer: D



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19. For the equation  $|x^2 - 2x - 3| = b$ , which of the following statements is true?

- A. For  $b < 0$ , there are no solutions
- B. For  $b = 0$ , there are three solutions
- C. For  $0 < b < 4$ , there are two solutions
- D. For  $b = 4$ , there are four solutions

**Answer: A**

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**20.** The converse of  $p \Rightarrow (q \Rightarrow r)$  is

- A.  $(q \wedge \neg r) \vee p$
- B.  $(\neg q \vee r) \vee p$
- C.  $(q \wedge \neg r) \wedge \neg p$
- D.  $(q \wedge \neg r) \wedge p$

**Answer: A**

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21. If  $4x + 3y - 12 = 0$  touches  $(x - p)^2 + (y - p)^2 = p^2$ , then the sum of all the possible values of  $p$  is

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22. If  $A$  and  $B$  are two events such that  $P(A) = \frac{4}{7}$ ,  $P(A \cap B) = \frac{3}{28}$  and the conditional probability  $P\left(\frac{A}{A^c \cup B^c}\right)$  (where  $A^c$  denotes the complement of the event  $A$ ) is equal to  $\lambda$ , then the value of  $\frac{26}{\lambda}$  is equal to

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23. If the number of terms free from radicals in the expansion of  $\left(7^{\frac{1}{3}} + 11^{\frac{1}{9}}\right)^{6561}$  is  $k$ , then the value of  $\frac{k}{100}$  is equal to

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24. Let  $y = \sqrt{x \log_e x}$ . If the value of  $\frac{dy}{dx}$  at  $x = e^4$  is  $k$ , then the value of  $4e^3 k$  is (use  $e = 2.7$ )

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25. If the value of the integral  $I = \int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \max(\sin x, \tan x) dx$  is equal to  $\ln k$ , then the value of  $k^2$  is equal to

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