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 $\left| -3A^{2019} + A^{2020} \right|$ 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° with the positive x - axis and $\left|\vec{a} - \hat{i}\right|$ is the geometric mean of $\left|\vec{a}\right|$ and $\left|\vec{a} - 2\hat{i}\right|$, then the value of $\left|\vec{a}\right|$ 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 $1, 2, 3, \ldots\ldots, 2n+1$ 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 $x = \sin\left(2\tan^{-1}3\right)$ 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° 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°. 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 $f:(-\infty, 1] \to \left(0, e^5\right]$ 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 $f(x) = \lim_{n \to \infty} \frac{(x-2)^{2n} - 1}{(x-2)^{2n} + 1} (\forall n \in N)$ 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 $y = \{(x.:, x \in [0, 1]), (2 - x, :, \xi n[1, 2])$ 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 ΔOAB is minimum, then OP is

A. Altitude through vertex O of ΔAOB

B. Median through vertex O of ΔAOB

C. Internal angle bisector through vertex O of ΔAOB

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 $\in [0, 1]$

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 $I = \int \frac{dx}{x^3(x^8+1)^{3/4}} = \frac{\lambda(1+x^8)^{\frac{1}{4}}}{x^2} + c$ (where c is the constant of integration), then the value of λ 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 $x^{2a}y^{3b} = e^{5m}, x^{3c}y^{4d} = e^{2n}, \Delta_1 = \begin{vmatrix} 5m & 3b \\ 2n & 4d \end{vmatrix}, \Delta_2 = \begin{vmatrix} 2a & 5m \\ 3c & 2n \end{vmatrix}$ 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. $(q \wedge \ -r) \vee p$

B. $(\sim q \vee r) \vee p$

C. $(q \wedge \sim r) \wedge \sim p$

D. $(q \wedge \sim r) \wedge p$

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 compliment of the event A) is equal to λ, 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 equa to

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