

MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 53

Mathematics

1. Let $A = [a_{ij}]$ be a square matrix of order 3 and $B = [b_{ij}]$ be a matrix such that $b_{ij} = 2^{i-j}a_{ij}$ for $1 \leq i, j \leq 3, \forall i, j \in N$.

If the determinant of A is same as its order, then the value of $\left| (B^T)^{-1} \right|$ is

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

B. 3

C. 9

D. $\frac{1}{27}$

Answer: A



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2. A person predicts the outcome of 20 cricket matches of his home team. Each match can result either in a win, loss or tie for the home team. The total number of ways in which he can make the predictions, so that exactly 10 predictions are correct, is equal to

A. ${}^{20}C_{10} \cdot 2^{10}$

B. ${}^{20}C_{10} \cdot 3^{20}$

C. ${}^{20}C_{10} \cdot 3^{01}$

D. ${}^{20}C_{10} \cdot 5^{20}$

Answer: A



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3. The quadratic equation whose roots are the arithmetic mean and the harmonic mean of the roots of the equation $x^2 + 7x - 1 = 0$ is

A. $14x^2 + 14x - 45 = 0$

B. $45x^2 - 14x + 14 = 0$

C. $14x^2 + 45x - 14 = 0$

D. $45x^2 + 14x - 45 = 0$

Answer: C



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4. If $a + b + c = 3$ and $a > 0, b > 0, c > 0$
then the greatest value of $a^2b^2c^2$ is

A. $\frac{3^{10}2^4}{7^7}$

B. $\frac{3^92^4}{7^7}$

C. $\frac{3^82^4}{7^7}$

D. $\frac{3^92^3}{7^6}$

Answer: A



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5. The point at which the line segment joining $A(1, 1)$ and $B(5, 5)$ subtends an obtuse angle is

A. $(7, 7)$

B. $(0, 5)$

C. $(2, 4)$

D. $(1, 5)$

Answer: C



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6. The average weight of students in a class of 35 students is 40 kg. If the weight of the teacher is included, then the average raises by $\frac{1}{3}$ kg. The weight of the teacher is

A. 40.5 kg

B. 50 kg

C. 41 kg

D. 52 kg

Answer: D



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7. Two straight roads OA and OB intersect at O.

A tower is situated within the angle formed by

them and subtends angles of 45° and 30° at

the points A and B where the roads are

nearest to it. If

OA = 400 meters and

OB = 300 meters, than the height of the tower
is

A. $250\sqrt{2}$ meters

B. 500 meters

C. $50\sqrt{14}$ meters

D. $100\sqrt{7}$ meters

Answer: C



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8. The value of $\lim_{x \rightarrow -\infty} \frac{x^2 \tan\left(\frac{1}{x}\right)}{\sqrt{4x^2 - x + 1}}$ is equal to

A. 1

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

C. -1

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

Answer: D



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9. The range of the function

$$f(x) = \sin^{-1}\left[x^2 - \frac{1}{3}\right] - \cos^{-1}\left[x^2 + \frac{2}{-}\right] \text{ is}$$

(where, $[x]$ represents the greatest integer value of x)

A. $[-\pi, 0]$

B. $\{-\pi, 0\}$

C. $\{0, \pi\}$

D. $\{0, \pi, -\pi\}$

Answer: B



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10. The point on the curve $6y = 4x^3 - 3x^2$, the tangent at which makes an equal angle with the coordinate axes is

- A. $\left(1, -\frac{1}{6}\right)$
- B. $\left(-1, -\frac{7}{6}\right)$
- C. $\left(-\frac{1}{2}, -\frac{5}{24}\right)$
- D. $\left(\frac{1}{2}, -\frac{1}{24}\right)$

Answer: C

11. Let $\int \frac{dx}{\sqrt{x^2 + 1} - x} = f(x) + C$ such that

$f(0) = 0$ and C is the constant of integration,

then the value of $f(1)$ is

A. $\frac{1}{\sqrt{2}} + \frac{1}{2} \ln(1 + \sqrt{2})$

B. $\frac{1}{2} + \frac{1}{\sqrt{2}} \ln(1 + \sqrt{2})$

C. $\frac{1}{2} + \frac{1}{2} \ln \sqrt{2} + 1$

D. $\frac{1}{\sqrt{2}} + \frac{1}{2} (1 + \ln(1 + \sqrt{2}))$

Answer: D



12. The solution of the differential equation

$$x \frac{dy}{dx} = y \ln\left(\frac{y^2}{x^2}\right) \text{ is (where, } c \text{ is an arbitrary}$$

constant)

A. $y = x \cdot e^{cx+1}$

B. $y = x \cdot e^{cx-1}$

C. $y = x^2 \cdot e^{cx+1}$

D. $y = x \cdot e^{cx^2 + \frac{1}{2}}$

Answer: D



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13. Let P be the image of the point $(3, 1, 7)$ with respect to the plane $x - y + z = 3$. The equation of the plane passing through P and parallel to $x - 2y + 3z = 7$ is

A. $x - 2y + 3z = 2$

B. $2x - 4y + 6z = 7$

C. $x + 2y - 6z + 2 = 0$

$$D. x - 2y + 3z + 2 = 0$$

Answer: D



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14. A person goes to the office either by a car, or scooter, or bus, the probability of which being $\frac{2}{7}, \frac{3}{7}, \frac{2}{7}$ respectively. The probability that he reaches office late if he takes a car, or scooter, or bus is $\frac{2}{9}, \frac{1}{9}, \frac{4}{9}$ respectively. If he reaches office in time, the probability that he

travelled by car is k , then the value of $24k + 7$ is equal to

A. 7

B. 14

C. $\frac{21}{2}$

D. $\frac{31}{2}$

Answer: B



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15. The solution of the system of equations

$$x + (\cos \alpha)y = 1 \text{ and } (\cos \alpha)x + 4y = 2$$

satisfy $x \geq \frac{4}{5}$ and $y \leq \frac{1}{2}$, then the value of α

can lie in the interval

A. $\alpha \in \left[\frac{\pi}{4}, \frac{\pi}{3} \right]$

B. $\alpha \in \left[0, \frac{\pi}{6} \right]$

C. $\alpha \in \left[\frac{\pi}{6}, \frac{\pi}{3} \right]$

D. $\alpha \in \left[\frac{\pi}{3}, \frac{\pi}{2} \right]$

Answer: D



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16. $\sum_{r=0}^n \left(\frac{r+2}{r+1} \right) \cdot {}^n C_r$ is equal to :

A. $\frac{2^n(n+2) - 1}{n+1}$

B. $\frac{2^n(n+1) - 1}{n+1}$

C. $\frac{2^n(n+4) - 1}{n+1}$

D. $\frac{2^n(n+3) - 1}{n+1}$

Answer: D



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17. If the complex numbers $\sin x + i \cos 2x$ and $\cos x - i \sin 2x$ are conjugate of each other, then the number of values of x in the interval $[0, 2\pi)$ is equal to (where, $i^2 = -1$)

A. 0

B. 1

C. 2

D. 3

Answer: A



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18. A variable line through the point $\left(\frac{6}{5}, \frac{6}{5}\right)$ cuts the coordinate axes at the points A and B respectively. If the point P divides AB internally in the ratio 2:1, then the equation of the locus of P is

A. $5xy = (2x + y)$

B. $5xy = 2(2x + y)$

C. $5xy = (x + 2y)$

D. $5xy = 2(x + 2y)$

Answer: B



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19. The value of $\tan 63^\circ - \cot 63^\circ$ is equal to

A. $\frac{\sqrt{5} - 1}{\sqrt{5} + 1} \sqrt{10 + 2\sqrt{5}}$

B. $\frac{2}{\sqrt{5} + 1} \sqrt{10 + 2\sqrt{5}}$

C. $\frac{\sqrt{5} - 1}{4} \sqrt{10 - 2\sqrt{5}}$

D. $\frac{\sqrt{5} - 1}{4} \sqrt{10 + 2\sqrt{5}}$

Answer: A



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20. The locus of a point which moves such that the difference of its distances from the points $(5, 0)$ and $(-5, 0)$ is 6 units is a conic, whose length of the latus rectum (in units) is equal to

A. 4

B. $\frac{16}{3}$

C. 8

D. $\frac{32}{3}$

Answer: D



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21. If the lengths of the sides of a right-angled triangle ABC, right angled at C, are in arithmetic progression, then the value of $5(\sin A + \sin B)$ is



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22. If $f(0) = 0$, $f(3) = 3$ and $f'(3) = 4$, then

the value of $\int_0^1 x f''(3x) dx$ is equal to



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23. The minimum value of x which satisfies the

inequality $\sin^{-1} x \geq \cos^{-1} x$ is λ , then the

value of 2λ is (use $\sqrt{2} = 1.41$)



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24. Let \vec{a} be a unit vector coplanar with $\hat{i} - \hat{j} + 2\hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$ such that \vec{a} is perpendicular to $\hat{i} - 2\hat{j} + \hat{k}$. If the projection of \vec{a} along $\hat{i} - \hat{j} + 2\hat{k}$ is λ , then the value of $\frac{1}{\lambda^2}$ is equal to



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25. A tangent and a normal are drawn at the point $P(8, 8)$ on the parabola $y^2 = 8x$ which cuts the axis of the parabola at the points A

and B respectively. If the centre of the circle through P, A and B is C, then the sum of $\sin(\angle PCB)$ and $\cot(\angle PCB)$ is equal to



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