MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 101

Mathematics

1. If the area covered by $y=\frac{2}{x}$ and $y=\frac{2}{2x-1}$ from $x=1 \text{ or } x=e$ is In (a) sq. units, then $(2e-1)^2a^2$ is equal to

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

B. e^4

C. 1

D. e

Answer: B

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2. If a, b, c are real numbers satisfying the condition $a+b+c=0$ then the roots of the quadratic equation $3ax^2+5bx+7c=0$ are

A. Positive

B. Negative

C. real and equal

D. distinct but not imaginary

Answer: D

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3. The indefinite integral $I=\int\frac{\left(\sin^2 x-\cos^2 x\right)^{2019}}{(\sin x)^{2021}(\cos x)^{2021}}dx$ simplifies to (where c is an integration constant)

A. $\frac{\left(\sin^2 x-\cos^2 x\right)^{2020}}{2020}+c$

B. $\dfrac{(\tan x-\cot x)^{2020}}{2020}+c$

C. $\dfrac{(\sin x-\cos x)^{2020}}{2020}+c$

D. $\dfrac{\left(\tan^2 x+\cot^2 x\right)^{2020}}{2020}+c$

Answer: B

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4. Coefficient of α^t in the expansion of $(\alpha+p)^{m-1}+(\alpha+p)^{m-2}(\alpha+q)+(\alpha+p)^{m-3}(\alpha+q)^2+\ldots\ldots+(\alpha$

, where $\alpha\neq-q$ and $p\neq q$ is

A. $\dfrac{{}^mC_t\left(t^t-q^t\right)}{p-q}$

B. $\dfrac{{}^mC_t\left(p^{m-1}-q^{m-1}\right)}{p-q}$

C. $\dfrac{{}^mC_t\left(p^t-q^t\right)}{p-q}$

D. $\dfrac{{}^mC_t\left(p^{m-t}+q^{m-t}\right)}{p-q}$

Answer: B

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5. The solution of the differential equation $\frac{dy}{dx} = \frac{2x - y}{x - 6y}$ is (where c is an arbitrary constant)

A. $4xy = x^2 - 3y + c$

B. $2xy = x^2 + 3y^2 + c$

C. $xy = x^2 + 3y^2 + c$

D. $xy = x^2 + c$

Answer: C

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6. Let a_1, a_2, a_3 be three positive numbers which are in geometric progression with common ratio r. The inequality $a_3 > a_2 + 2a_1$ holds true if r is equal to

A. 2

B. 1.5

C. 0.5

D. 2.5

Answer: D

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7. The arithmetic mean of the numbers $2\sin 2^\circ, 4\sin 4^\circ, 6\sin 6^\circ, \ldots\ldots\ldots\ldots 178\sin 178^\circ, 180\sin 180^\circ$

A. $\sin 1^\circ$

B. $\cot 1^\circ$

C. $\tan 1^\circ$

D. $\cos 1^\circ$

Answer: B

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8. If PQ is the focal chord of the parabola $y^2 = -x$ and P is $(-4, 2)$, then the ordinate of the point of intersection of the tangents at P and Q is

A. $\frac{15}{16}$

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

C. 4

D. $\frac{17}{18}$

Answer: A

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9. Consider $f(x) = \begin{cases} [x] + [-x] & x \neq 2 \\ \lambda & x = 2 \end{cases}$ where $[.]$ denotes the greatest integer function. If $f(x)$ is continuous at $x = 2$ then the value of λ is equal to

A. -1

B. 0

C. 1

D. No value of possible

Answer: A

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10. Consider the statement p : If a hexagon is regular than all its sides and angles are equal. The contrapositive of statement p is

A. If all sides and angles of a hexagon are not equal then it is not regular

B. If all sides and angles of a hexagon are equal then it is regular

C. If all sides and angles of a hexagon are not equal then it is regular

D. If all sides and angles of a hexagon are equal then it is not regular

Answer: A

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11. If $\sin\left(\cot^{-1}(1-x)\right)=\cos\left(\tan^{-1}(-x)\right)$, then x is

A. 1

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

C. 0

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

Answer: B

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12. A circle C_1 has radius 2 units and a circles C_2 has radius 3 units. The distance between the centres of C_1 and C_2 is 7 units. If two points, one tangent to both circles and the other passing through the centre of both circles, intersect at point P which lies between the centers of C_1 and C_2, then the distance between P and the centre of C_2 is

A. $\frac{9}{4}$ units

B. $\frac{7}{3}$ units

C. $\frac{21}{5}$ units

D. $\frac{14}{5}$ units

Answer: C

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13. The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is

A. 0

B. 5

C. 4

D. 10

Answer: C

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14. From the point $P(3, 4)$ pair of tangents PA and PB are drawn to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. If AB intersects y - axis at C and x - axis at D, then OC. OD is equal to (where O is the origin)

A. 9

B. 18

C. 8

D. 12

Answer: D

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15. For two non - zero complex numbers A and B, if $A+\frac{1}{B}=\overline{A}$ and $\frac{1}{A}+B=\overline{B}$, then

A. A is purely real

B. B is purely real

C. $|AB|=\frac{1}{2}$

D. $|A|=|B|$

Answer: C

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16. The value of the determinant $\Delta=\begin{vmatrix}\sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5\end{vmatrix}$ is equal to

A. $15\sqrt{2}-25\sqrt{3}$

B. $25\sqrt{3}-15\sqrt{2}$

C. $3\sqrt{5}$

D. $-15\sqrt{2}+7\sqrt{3}$

Answer: A

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17. Two dice are thrown at a time, the probability that the absolute value of the difference of number on dice is 3, is

A. $\frac{3}{4}$

B. $\frac{5}{6}$

C. $\frac{2}{7}$

D. $\frac{1}{6}$

Answer: D

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18. Let $\vec{a}, \vec{b}, \vec{c}$ be three non - zero, non - coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ be three vectors given by $\vec{p} = \vec{a} + 2\vec{b} - 2\vec{c}, \vec{q} = 3\vec{a} + \vec{b} - 3\vec{c}$ and $\vec{r} = \vec{a} - 4\vec{b} + 4\vec{c}$. If the volume of parallelepiped determined by $\vec{a}, \vec{b}$ and $\vec{c}$ is v_1 cubic units and volume of tetrahedron determined by $\vec{p}, \vec{q}$ and $\vec{r}$ is v_2 cubic units, then $\frac{v_1}{v_2}$ is equal to

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

B. $\frac{3}{4}$

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

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

Answer: D

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19. The number of matrices X with entries $\{0, 2, 3\}$ for which the sum of all the principal diagonal elements of $X. X^T$ is 28 (where X^T is the transpose matrix of X), is

A. 12

B. 18

C. 36

D. 44

Answer: C

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20. Let $f(x) = 2\tan^3 x - 6\tan^2 x + 1 + sgn(e^x), \forall x \in \left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$,

Then the positive difference between the least value and the local maximum value of the function is (where sgn (f(x)) represents the signum function)

A. 7

B. 8

C. 9

D. 10

Answer: B

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21. If the integral $I = \int_0^{\pi} = \frac{\sec^{-1}(\sec x)}{1+\tan^8 x} dx, \forall x \neq \frac{\pi}{2}$, then the value of $[I]$ is equal to (where $[.]$ is the greatest integer function)

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22. The value of $\lim_{x \to 0} \frac{\log(1+2x)}{5x} + \lim_{x \to 2} \frac{x^4 - 2^4}{x-2}$ is equal to

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23. The sum of square of the abscissas fo all the points on the line $x + y = 4$ that lie at a unit distance from the line $4x + 3y - 10 = 0$ is

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24. The line $\frac{x}{k} = \frac{y}{2} = \frac{z}{-12}$ makes an isosceles triangle with the planes $2x + y + 3z - 1 = 0$ and $x + 2y - 3z - 1 = 0$ then the value of k is-

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25. If the total number of ways of selecting two numbers from the set $\{1, 2, 3, \ldots\ldots\ldots, 89, 90\}$ such that their sum is divisible by 3 is k, then $\frac{k}{500}$ is

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