MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 39

Mathematics

1. If the area bounded by $y = x^2$ and $y = \frac{2}{1+x^2}$ is $\left(K_1\pi - \frac{K_2}{3}\right)$ sq. units (where $K_1, K_2 \in Z$), then the value of $(K_1 + K_2)$ is equal to

A. 3

B. 1

C. -1

D. -2

Answer: A

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2. Let A and B be two sets. The set A has 2016 more subsets than B. If $A \cap B$ has 3 members, then the number of members in $A \cup B$ is

A. 10

B. 11

C. 12

D. 13

Answer: D

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3. Let $f(x) = \frac{25^x}{25^x + 5}$, then the number of solution (s) of the equation $f(\sin^2\theta) + f(\cos^2\theta) = \tan^2\theta, \theta$ is/are $\in [0, 10\pi]$

A. 10

B. 2

C. 40

D. 20

Answer: D

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4. Let $V_1 =$ variance of $\{13, 16, 19. \ldots \ldots \ldots \ldots 103\}$ and $V_2 =$ variance of $\{20, 26, 32. \ldots \ldots \ldots \ldots$. Then $V_1 : V_2$ is

A. $1:2$

B. $1:1$

C. $4:9$

D. $1:4$

Answer: D

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5. The function $f(x) = \sin^{-1}(2x - x^2) + \sqrt{2 - \frac{1}{|x|}s + \frac{1}{[x^2]}}$ defined in the interval (where $[.]$ is the greatest integer function)

A. $x \in (1 - \sqrt{2}, 1)$

B. $x \in [1, 1 + \sqrt{2}]$

C. $x \in [1 - \sqrt{2}, 1 + \sqrt{2}]$

D. $x \in [1 - \sqrt{2}, 2]$

Answer: B

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6. If the foot of perpendicular drawn from the point (2, 5, 1) on a line passing through $(\alpha, 2\alpha, 5)$ is $\left(\frac{1}{5}, \frac{2}{5}, \frac{3}{5}\right)$, then α is equal to

A. $\frac{19}{9}$

B. $\frac{11}{570}$

C. $\frac{57}{54}$

D. $\frac{1}{25}$

Answer: D

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7. Let the line $y = mx$ and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co - ordinate axes at $\left(-\frac{1}{3\sqrt{2}}, 0 \right)$ and $(0, \beta)$, then β is equal to

A. $\frac{2\sqrt{2}}{3}$

B. $\frac{2}{\sqrt{3}}$

C. $\frac{2}{3}$

D. $\frac{\sqrt{2}}{3}$

Answer: D

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8. Throwing a biased die, a person will get 5 Rupees if the throws the number 5 and will get 8 Rupees for any other number, then the expected income (in Rupees) per throw is (it is given that the number 5 will appear 5 times as frequently as any other number)

A. 6.5

B. 7

C. 5

D. 5.5

Answer: A

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9. The sum of four numbers in arithmetical progression is 48 and the product of the extremes to the product of the means as 27 to 35 Find the numbers

A. 10

B. 12

C. 14

D. 18

Answer: D

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10. The solution of the differential equation $\frac{dy}{dx} = \frac{y\cos x - y^2}{\sin x}$ is equal to (where c is an arbitrary constant)

A. $\sin x = x - y + c$

B. $\sin x = x + y + c$

C. $\sin x = xy + cy$

D. $\frac{\sin x}{x} = y + c$

Answer: C

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11. If $|a| < 1$ and $|b| < 1$, then the sum of the series $a(a+b) + a^2(a^2+b^2) + a^3(a^3+b^3) + \ldots\ldots \infty$ is

A. $\frac{a}{1-a} + \frac{ab}{1-ab}$

B. $\frac{a^2}{1-a^2} + \frac{ab}{1-ab}$

C. $\frac{b}{1-b} + \frac{a}{1-a}$

D. $\frac{b^2}{1-b^2} + \frac{ab}{1-ab}$

Answer: B

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12. The angle of elevation of a cloud from a point 10 meters above the surface of a lake is 30° and the angle of depression of its reflection from that point is 60°. Then the height of the could above the lake is

A. 20 meters

B. $20\sqrt{3}$ meters

C. $\frac{20\left(\sqrt{3}-1\right)}{\sqrt{3}}$ meters

D. $20\left(\sqrt{3}-1\right)$ meters

Answer: A

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13. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, $\Sigma_{r=0}^{n}\left((r+1)^2\right)C_r = 2^{n-2} f($

and if the roots of the equation f(x) = 0 are α and β, then the value of $\alpha^2 + \beta^2$ is equal to (where C_r denotes $.^n C_r$)

A. 13

B. 10

C. 17

D. 20

Answer: C

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14. If $I = \int \frac{\tan^{-1}(e^x)}{e^x + e^{-x}} dx = \frac{\left[\tan^{-1}(f(x))\right]^2}{2} + C$ (where C is the constant of integration), then the range of $y = f(x) \forall x \in R$ is

A. $(-\infty, \infty)$

B. $[0, \infty)$

C. (o, ∞)

D. $(-\infty, 0)$

Answer: C

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15. For $x > 0$. let $\mathrm{A} = \begin{bmatrix} x + \frac{1}{x} & 0 & 0 \\ 0 & 1/x & 0 \\ 0 & 0 & 12 \end{bmatrix}$, $B = \left[\left(\frac{x}{6(x^2+1)}, 0, 0\right), \left(0, \frac{x}{4}, 0\right)\right.$ be two matrices and $C = AB + (AB)^2 + \ldots. + (AB)^n$. Then, $Tr\left(\lim_{n \to \infty} C\right)$ is equal to (where $Tr(A)$ is the trace of the matrix A i.e. the sum of the principle diagonal elements of A)

A. 1

B. $\frac{31}{30}$

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

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

Answer: B

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16. The perpendicular bisector of a line segment with end points (1, 2, 6) and $(-3, 6, 2)$ passes through $(-6, 2, 4)$ and has the equation of the form $\frac{x+6}{l} = \frac{y-2}{m} = \frac{z-4}{n}$ (where $l > 0$), then the value of $lmn - (l + m + n)$ equals to

A. -3

B. -5

C. -7

D. -9

Answer: C

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17. Consider the family of lines $5x + 3y - 2 + \lambda(3x - y - 4) = 0$ and $x - y + 1 + \mu(2x - y - 2) = 0$. The equation of a straight line that belonges to both the families is

A. $5x - 2y - 7 = 0$

B. $3x + y - 2 = 0$

C. $5x + 2y - 3 = 0$

D. $2x + y - 1 = 0$

Answer: A

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18. If A, B are two non - singular matrices of order 3 and I is an identity matrix of order 3 such that $AA^T = 5I$ and $3A^{-} = 2A^T - Aadj(4B)$, then $|B|^2$ is equal to (where A^T and $adj(A)$ denote transpose and adjoint matrices of the matrix A respectively)

A. $\frac{7^3}{5^3.4^6}$

B. $\frac{7^3}{5^3.4^4}$

C. $\frac{7^4}{5^3.2^{12}}$

D. $\frac{5^6}{7^3.2^{10}}$

Answer: A

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19. If $A_n = \int_0^{n\pi} |\sin x| dx,\ \forall n \in N$, then $\Sigma_{r=1}^{10} A_r$ is equal to

A. 100

B. 110

C. 55

D. 105

Answer: B

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20. The perimeter of the locus of the point at which the two circules $x^2 + y^2 = 1$ and $(x-4)^2 + y^2 = 4$ subtend equal angles is

A. $\left(\frac{4}{3}\right)\pi$

B. $\left(\frac{8}{3}\right)\pi$

C. $\left(\frac{2}{3}\right)\pi$

D. $\left(\frac{16}{3}\right)\pi$

Answer: D

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21. The difference between the maximum and minimum values of the function $f(x) = x^3 - 3x + 4,\ \forall x \in \{0, 1]$ is

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22. Given $\vec{a}, \vec{b}$ and $\vec{c}$ are 3 vectors such that $\vec{b}, \vec{c}$ are parallel unit vectors and $\left|\vec{a}\right| = 3$. If $\vec{a} + \lambda\vec{c} = 4\vec{b}$, then the sum of all the possible positive values of λ is

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23. Let $f(x)$ is a differentiable function on $x \in R$, such that $f(x+y) = f(x)f(y)$ for all $x, y \in R$ where $f(0) \neq 0$. If $f(5) = 10$, $f'(0) = 0$, then the value of $f'(5)$ is equal to

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24. If x and y are the solutions of the equation $12\sin x + 5\cos x = 2y^2 - 8y + 21$, then the value of $12\cot\left(\frac{xy}{2}\right)$ is (Given, $|x| < \pi$)

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25. The value of $\left(\Sigma_{k=1}^{4}\right)\left(\sin.\frac{2\pi k}{5} - i\cos.\frac{2\pi k}{5}\right)^4$ is (where i is iota)

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