MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 74

Mathematics

1. If $A = \int_0^{\frac{\pi}{2}} \frac{\sin^3 x}{1+\cos^2 s} dx$ and $B = \int_0^{\frac{\pi}{2}} \frac{\cos^2 x}{1+\sin^2 x} dx$, then $\frac{2A}{B}$ is equal to

A. $-2A$

B. 4

C. 2

D. -4

Answer: C

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2. The area of the quadrillateral formed by the tangents and normals at the extremities of the latus rectum of the parabola $y^2 - 4y + 4 + 12x = 0$ is

A. 36 sq. units

B. 72 sq. units

C. 144 sq. units

D. 96 sq. units

Answer: B

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3. If the local minimum of the function $f(x) = x^3 - 3a^2x + 4(\forall a > 0)$ occurs at $x = \lambda(\forall \lambda > 1)$, then a may take the value

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

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

C. $\frac{4}{5}$

D. 0

Answer: B

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4. The vertex of the right angle of a right angled triangle lies on the straight line $2x - y - 10 = 0$ and the two other vertices, at points $(2, -3)$ and $(4, 1)$ then the area of triangle in sq. units is-

A. $\sqrt{10}$

B. 3

C. $\frac{33}{5}$

D. 11

Answer: B

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5. The differential equation of the family of ellipses having centres along the line y = 4 and major and minor axes parallel to the coordinate axes is of the order

A. 4

B. 3

C. 2

D. 1

Answer: B

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6. An equilateral triangle is inscribed in the ellipse whose equation is $x^2 + 4y^2 = 4$. One vertex of the triangle (0, 1)

and one altitude is contained in the y - axis. If the length of each side is $k\sqrt{3}$ units, then k is

A. $\frac{16}{13}$

B. $\frac{8}{13}$

C. $\frac{13}{16}$

D. $\frac{13}{8}$

Answer: A

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7. The value of $\Sigma_{k=1}^{99}\left(i^{k!}+\omega^{k!}\right)$ is (where, $i=\sqrt{-1}$ amd ω is non - real cube root of unity)

A. $190+\omega$

B. $192 + \omega^2$

C. $190 + i$

D. $102 + i$

Answer: C

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8. If the fucntion $f(x) = \begin{cases} a\sqrt{x+7} & 0 \leq x < 2 \\ bx + 5 & x \geq 2 \end{cases}$ is differentiable $\forall x \geq 0$, then $2a + 4b$ is equal to

A. $\frac{240}{16}$

B. 5

C. $\frac{85}{16}$

D. $\frac{250}{16}$

Answer: B

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9. Consider a matrix $A = [a_{ij}[_{-}(3 \times 3)$ where, $a_{ij} = \begin{cases} i + 2j & ij = \text{even} \\ 2i - 3j & ij = \text{odd} \end{cases}$. If b_{ij} is the cafactor of a_{ij} in matrix A and $C_{ij} = \Sigma_{r=1}^{3} a_{ir} b_{jr}$, then $\left[C_{ij}\right]_{3 \times 3}$ is

A. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 5 & -7 \\ 4 & 6 & 8 \\ 3 & 9 & -3 \end{bmatrix}$

C. $\begin{bmatrix} 88 & 0 & 0 \\ 0 & 88 & 0 \\ 0 & 0 & 88 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 3 & 1 \\ 1 & 6 & 2 \\ -1 & 5 & 2 \end{bmatrix}$

Answer: C

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10. Consider a function $f(x) = x^x$, $\forall x \in [1, \infty)$. If $g(x)$ is the inverse function of $f(x)$, then the value of $g'(4)$ is equal to

A. $\log_2 e$

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

C. $\frac{1}{4}\log_{2e} e$

D. $\frac{1}{2}\log_2 2e$

Answer: C

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11. The standard deviation of a distribution is 30. If each observation is increased by 5, then the new standard deviation will be

A. 32

B. 28

C. 27

D. None of these

Answer: D

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12. The range of the function

$f(x) = 2\sqrt{3x^2 - 4x + 5}$ is

A. $\left[-\infty, 2\sqrt{\frac{11}{2}}\right]$

B. $\left(-\infty, 2\sqrt{\frac{11}{3}}\right]$

C. $\left[2, \sqrt{\frac{11}{3}}, \infty\right)$

D. $\left(2\sqrt{\frac{11}{3}}, \infty\right)$

Answer: C

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13. If A, B, C are three events such that $P(B) = \frac{4}{5}, P(A \cap B \cap C^c) = \frac{1}{4}$ and $P(A^c \cap B \cap C^c) = \frac{1}{3}$, then $P(B \cap C)$ is equal to

A. $\frac{11}{60}$

B. $\frac{1}{5}$

C. $\frac{13}{60}$

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

Answer: C

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14. If the line $\frac{x-1}{5} = \frac{y-3}{2} = \frac{z-3}{2}$ intersects the curve $x^2 - y^2 = k^2, z = 0$, then the value of 2k can be equal to

A. -13

B. $-\frac{13}{2}$

C. $\frac{13}{2}$

D. $\frac{13}{4}$

Answer: A

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15. Let $A = \begin{bmatrix} 1 & 0 & 3 \\ 0 & b & 5 \\ -\frac{1}{3} & 0 & c \end{bmatrix}$, where a, b, c are positive integers. If $tr(A) = 7$, then the greatest value of $|A|$ is (where tr (A) denotes the trace of matric A i.e. the sum of principal diagonal elements of matrix A)

A. 6

B. 12

C. 15

D. 10

Answer: C

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16. The value of $\lim_{x \to \frac{\pi}{6}} \frac{2\cos\left(x + \frac{\pi}{3}\right)}{\left(1 - \sqrt{3}\tan x\right)}$ is equal to

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

B. $\sqrt{3}$

C. $\frac{\sqrt{3}}{4}$

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

Answer: D

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17. Coefficient of t^{24} in $\left(1+t^2\right)^{12}\left(1+t^{12}\right)\left(1+t^{24}\right)$ is :

A. $.^{12}C_6+3$

B. $.^{12}C_6+1$

C. $.^{12}C_6$

D. $.^{12}C_6+2$

Answer: D

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18. If $1 \in (\alpha, \beta)$ where α, β are the roots of the equation $x^2 - a(x+1) + 3 = 0$, then

A. $a > 2$

B. $a < -6$ and $a > 2$

C. $-6 < a < 2$

D. $a < 2$

Answer: A

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19. Let the function $f(x) = |x+1|$. The number of values of $x \in [-2, 2]$ for which $f(x-3)$, $f(x-1)$ and $f(x+1)$ are in the arithmetic progression is

A. 0

B. 1

C. 2

D. inifinte

Answer: C

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20. If $\sin x + \cos y = \frac{1}{3}$ and $\cos x + \sin y = \frac{3}{4}$, then the value of $\tan\left(\frac{x-y}{2}\right)$ is equal to

A. $\frac{5}{13}$

B. $\frac{12}{13}$

C. $-\frac{5}{13}$

D. $-\frac{5}{12}$

Answer: C

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21. If the integral $I=\int\left(-\frac{\sin x}{x}-\ln x \cos x\right)dx=f(x)+C$ (where, C is the constant of integration) and $f(e)=-\sin e$, then the number of natural numbers less than $\left[f\left(\frac{\pi}{6}\right)\right]$ is equal to (where $[.]$ is the greatest integer function)

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22. If M and m are the maximum and minimum values of $\frac{y}{x}$ for pair of real numbers (x, y) which satisfy the equation $(x-3)^2+(y-3)^2=6$, then the value of $\frac{1}{M}+\frac{1}{m}$ is

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23. If the maximum value of x which satisfies the inequality $\sin^{-1}(\sin x) \geq \cos^{-1}(\sin x)$ for $x \in \frac{\pi}{2}, 2\pi$ is λ, then $\frac{2\lambda}{3}$ is equal to (take $\pi = 3.14$)

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24. If $\vec{a_1}, \vec{a_2}, \vec{a_3}$ and $\vec{b_1}, \vec{b_2}, \vec{b_3}$ be two sets of non - coplanar vectors, such that

$\vec{a_p} \cdot \vec{b_q} = \begin{cases} 0 & \text{if } p \neq q \\ 4 & \text{if } p = q \end{cases}$ for $p = 1, 2, 3$ and $q = 1, 2, 3,$

then the value of $\left[\vec{a_1} 2\vec{a_2} 3\vec{a_3}\right]\left[\vec{b_1} + \vec{b_2} \quad \vec{b_2} + \vec{b_3} \quad \vec{b_3} \quad \vec{b_3} + \vec{b_1}\right]$ is equal to

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25. The number of different ways in which the first twelve natural numbers can be divided into three groups, each having four elements, such that the numbers in each group are in arithmetic progression is

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