MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 93

Mathematics

1. If $f(x) = \begin{cases} px + q & : x \leq 2 \\ x^2 - 5x + 6 & : 2 < x < 3 \\ ax^2 + bx + 1 & : x \geq 3 \end{cases}$

is differentiable everywhere, then $|p| + |q| + \left|\frac{1}{a}\right| + \left|\frac{1}{b}\right|$ is equal to

A. $\frac{71}{10}$

B. $\frac{51}{10}$

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

D. $\frac{31}{5}$

Answer: A

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2. If p and q are logical statements, then $p \Rightarrow (\sim q \Rightarrow p)$ is equivalent to

A. $p \Rightarrow (p \Rightarrow q)$

B. $p \Rightarrow (p \wedge q)$

C. $p \Rightarrow (p \wedge q)$

D. $p \Rightarrow (p \Leftrightarrow q)$

Answer: B

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3. In a cubicul hall $ABCDPQRS$ with each side $10m$, G is the centre of the walls $BCRQ$ and T is the midpoint of the side AB, the angle of elevation of G at the Point T is

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4. If f(x) is a non - negative function such that the area bounded by $y = f(x)$, x - axis and the lines x = 0 and $x = \alpha$ is $4\alpha \sin \alpha + 2$ sq. Units $(\forall \alpha \in [0, \pi])$, then the value of $f\left(\frac{\pi}{2}\right)$ is equal to

A. 0

B. 1

C. 2π

D. 8π

Answer: B

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5. If $I_1 = \int_0^{2\pi} \sin^3 x dx$ and $I_2 = \int_0^1 \ln\left(\frac{1}{x} - 1\right) dx$, then

A. $I_1 + I_2 > 0$

B. $I + I_2 < 0$

C. $I_1 < I_2$

D. $I_1 = I_2$

Answer: D

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6. Let the lines

$(y - 2) = m_1(x - 5)$ and $(y + 4) = m_2(x - 3)$

intersect at right angles at P (where m_1 and m_2 are parameters). If locus of P is $x^2 + y^2 + gx + fy + 7 = 0$, then $\left(\frac{g}{2}\right)^2 + \left(\frac{f}{2}\right)^2 - 7$ is equal to

A. 1

B. 2

C. 8

D. 10

Answer: D

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7. The differential equation of the family of curves $py^2 = 3x - p$ is (where p is an arbitrary constant) is

A. $y\frac{dy}{dx} = y + x$

B. $y\frac{dy}{dx} = 1$

C. $y^2 = \frac{dy}{dx}$

D. $y^2 = 2xy\frac{dy}{dx} - 1$

Answer: D

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8. If $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{a} . \vec{b} = 2$ and $\vec{a} \times \vec{b} = \hat{i} + 2\hat{j} + \hat{k}$, then $\vec{b}$ is equal to

A. $15\hat{i} - 8\hat{j} + \hat{k}$

B. $\frac{1}{29}\left(15\hat{i} - 8\hat{j} + \hat{k}\right)$

C. $\frac{1}{5}\left(2\hat{i} + \hat{j} + \hat{k}\right)$

D. $2\hat{i} + \hat{j} + \hat{k}$

Answer: B

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9. Let $A(\alpha) = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha \\ 0 & 1 & 0 \\ \sin\alpha & 0 & \cos\alpha \end{bmatrix}$ and $[x \quad y \quad z] = [0 \quad 1 \quad 0]$. If the system of equations has infinite solutions and sum of all the possible value of α in $[0, 2\pi]$ is $k\pi$, then the value of k is equal to

A. 0

B. 2

C. 4

D. 8

Answer: C

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10. Two lines L_1 and L_2 of slops 1 are tangents to $y^2 = 4x$ and $x^2 + 2y6(2) = 4$ respectively, such that the distance d units between L_1 and L_2 is minimum, then the value of d is equal to

A. $\sqrt{3} - \frac{1}{\sqrt{2}}$

B. $\sqrt{3} + \frac{1}{\sqrt{2}}$

C. $\sqrt{2} - 1$

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

Answer: A

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11. A bag contains 21 markers with numbers 1 to 21. A maker is drawn at random and then replaced and then a second marker is drawn. The probability that the first number is odd and the second is even is

A. $\frac{10}{21}$

B. $\frac{11}{21}$

C. $\frac{110}{441}$

D. $\frac{100}{441}$

Answer: C

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12. In $\left(33+\frac{1}{33}\right)^{n}$ if the ratio of 7th term from the beginning to the 7th term from the end is 1/6, then find the value of n.

A. 13

B. 16

C. 9

D. 23

Answer: C

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13. The number of ways in which 10 boys can take positions around a circular round table, if two particular boys must not be seated side by side, is

A. $2 \times 48!$

B. 12

C. 360

D. $7 \times 8!$

Answer: D

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14. If the equation $x^2 = ax + b = 0$ has distinct real roots and $x^2 + a|x| + b = 0$ has only one real root, then which of the following is true? $b = 0, a > 0$ b. $b = 0, a < 0$ c. $b > 0, a < 0$ d. $b\langle 0, a\rangle 0$

A. $b = 0, a > 0$

B. $b > 0, a < 0$

C. $b > 0, a > 0$

D. $b > 0, a > 0$

Answer: A

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15. If $a = \underbrace{111.....1}_{55 \text{ times}},$

$b = 1 + 10 + 10^2 + 10^3 + 10^4$ and

$c = 1 + 10^5 + 10^{10} + ... + 10^{50}$, then

A. $b, \frac{a}{2}, c$ are in arithmetic progression

B. $b, \sqrt{a}, c$ are in geometric progression

C. a, b, c are in geometric progression

D. $a, \sqrt{b}, c$ are in arithmetic progression

Answer: B

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16. The expression $\sin 27^\circ \cos 57^\circ \sin 87^\circ$ simplifies to

A. $\frac{\sin 9^\circ}{4}$

B. $\frac{\cos 9^\circ}{4}$

C. $\frac{\sin 9^\circ}{2}$

D. $\frac{\cos 9^\circ}{2}$

Answer: B

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17. If $I = \int \frac{dx}{\sqrt[3]{x^{\frac{5}{2}}(1+x)^{\frac{7}{2}}}} = kf(x) + c$, where c is the integration constant and $f(1) = \frac{1}{2^{\frac{1}{6}}}$, then the value of f(2) is

A. $6\left(\frac{2}{3}\right)^{\frac{1}{6}}$

B. $6\left(\frac{3}{2}\right)^{\frac{1}{6}}$

C. $\left(\frac{2}{3}\right)^{\frac{1}{6}}$

D. $\left(\frac{2}{3}\right)^{6}$

Answer: C

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18. A plane P = 0 is the perependicular bisector of the line joining the points (2, 3, 4) and (6, 7, 8). The perpendicular distance of P = 0 from the origin is

A. $4\sqrt{3}$ units

B. $5\sqrt{3}$ units

C. $6\sqrt{3}$ units

D. $8\sqrt{3}$ units

Answer: B

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19. The focal chord of the parabola $y^2 = 32x$ touches the ellipse $\frac{x^2}{4^2} + \frac{y^2}{2^2} = 1$ in the first quadrant at the point

A. $(2, \sqrt{3})$

B. $\left(\frac{\sqrt{3}}{2}, \frac{3}{2}\right)$

C. $\left(\frac{4}{\sqrt{2}}, \frac{2}{\sqrt{2}}\right)$

D. $\left(\frac{2}{\sqrt{2}}, \frac{4}{\sqrt{2}}\right)$

Answer: A

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20. If m and M denotes the minimum and maximum value of $|2z+1|$, where $|z-2i| \leq 1$ and $i^2 = -1$, then the value of $(M-n)^2$ is equal to

A. 17

B. 34

C. 51

D. 16

Answer: D

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21. If $L = \lim_{x \to 0} \left(\frac{e^{-\frac{x^2}{2}} - \cos x}{x^2 \tan^2 x} \right)$, then the value of 3L is equal to

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22. If $A_1, A_2, A_3 \ldots\ldots\ldots . A_{20}$ are 20 skew - symmetric matrices of same order and $B = \Sigma_{r=1}^{20} 2r(A_r)^{(2r+1)}$,

then the sum of the principal diagonal elements of matrix B is equal to

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23. If the locus of the image of the point $(\lambda^2, 2\lambda)$ in the line mirror $x - y + 1 = 0$ (where λ is a parameter) is

$(x - a)^2 = b(y - c)$ where $a, b, c \in I$, then the value of $\left(\frac{a+b}{c+b}\right)$ is equal to

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24. The number of values of a for which the curves $4x^2 + a^2y^2 = 4a^2$ and $y^2 = 16x$ are orthogonal is

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25. The number of solutions of the equation $\log_{\sqrt{2}\sin x}(1 + \cos x) = 2$ in the interval $[0, 5\pi]$ is

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