MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 56

Mathematics

1. If z_1, z_2 are complex numbers such that $z_1^2 + z_2^2$ is real. If $z_1\left(z_1^2 - 3z_2^2\right) = 2$ and $2_2\left(3z_1^2 - z_2^2\right) = 11$, then the value of $z_1^2 + z_2^2$ is equal to

A. 25

B. 5

C. $\sqrt{5}$

D. 1

Answer: B

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2. If matrix $A = \left[a_{ij}\right]_4 \times 4$ such that

$a_{ij} = \begin{cases} 3 & i = j \\ 0 & \text{i} \neq j \end{cases}$ and det (adj (adj A)) = 3^k , then k is

A. 12

B. 20

C. 28

D. 36

Answer: D

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3. If $x, y, z \in R^+$ and $16\left(16x^2 + y^2 - 4xy\right)$ then = z(16x + 4y – z),

A. y, z, x are in A.P.

B. y, z, x are in G. P.

C. x, y, z are in A.P.

D. x, y, z are in G. P.

Answer: D

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4. The number of ordered pairs (m,n) where $m, n \in \{1, 2, 3\ldots . . , 50\}$ such that $6^m + 9^n$ is a multiple of 5 is

A. 1250

B. 2500

C. 625

D. 500

Answer: A

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5. The focal chord to $y^2 = 16x$ is tangent to $(x - 6)^2 + y^2 = 2$, then the possible values of the slope of this chord are

A. {-1,1}

B. {-2,1}

C. $\left\{ -2, \frac{1}{2} \right\}$

D. $\left\{2, -\frac{1}{2}\right\}$

Answer: A

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6. If $x+y=k$ is a tangent to the hyperbola $x^2-2y^2=18$,then sum of squares of possible values of k is

A. 3

B. 9

C. 12

D. 18

Answer: D

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7. The equation of the common tangent to the circles $x^2 + y^2 + 6x + 18y + 26 = 0$ and $x^2 + y^2 - 4x - 67 - 12 = 0$ at their point of contact is _______

A. $12x + 5y + 19 = 0$

B. $5x + 12y + 19 = 0$

C. $5x - 12y + 19 = 0$

D. $12x - 5y + 19 = 0$

Answer: B

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8. A ray of light coming along the line 3x + 4y - 5 = 0 gets reflected from the line ax + by - 1= 0 and goes along the line 5x -

12y - 10 = 0, then

A. $a = \frac{64}{115}, b = \frac{112}{15}$

B. $a = -\frac{64}{115}, b = \frac{8}{15}$

C. $a = \frac{64}{115}, b = -\frac{8}{15}$

D. $a = -\frac{64}{115}, b = -\frac{8}{15}$

Answer: C

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9. Let f(x) , then $\begin{cases} |x-2| + a^2 - 9a - 9 & \text{if } x < 2 \\ 2x - 3 & \text{if } x \geq 2 \end{cases}$ find the set of values of a such that x = 2 is the point of local minima

A. $(-\infty, -1] \cup [10, \infty)$

B. $(-1, 10)$

C. $(-\infty, -10)$

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

Answer: A

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10. The number of points of non differentiability of the function f(x) = max(sin x, 2x) (where + (max(sin x, 2x)] [.] denotes greatest integer function) in $(0, 2\pi)$ is

A. 12

B. 14

C. 17

D. 18

Answer: A

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11. If f (x) is continuous such that

$f(x) = f(3x - 4y) + f(4y - 2x) - (3x - 4y)(4y - 2x)\,\forall x, y \in R$

and $\lim_{h \to 0} \frac{f(h)}{h} = 4$ then f' (2) is

A. 1

B. 2

C. 3

D. 4

Answer: B

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12. If $f(x) \geq 0 \forall \in (0, 2)$ and $y = f(x)$ makes positive intercepts of 2 and 1 unit on x and y-axis, respectively and encloses an area of $\frac{3}{4}$ sq. units with x = 0, x = 2 and y = 0, then $\int_0^2 x f'(x) dx$ (where f (x) is continuous and differentiable) is

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

B. 1

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

D. $-\frac{3}{4}$

Answer: D

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13. Solution of differential equation, $\frac{dt}{dx} = \frac{t\left(\frac{d}{dx}(g(x))\right) - t^2}{g(x)}$ is

A. $t = \frac{g(x) + c}{x}$

B. $t = \frac{g(x)}{x} + c$

C. $t = \frac{g(x)}{x + c}$

D. $t = g(x) + x + c$

Answer: B

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14. $\int x^{-2/3}\left(1 + x^{1/2}\right)^{-5/3}$ dx is equal to

A. $3\left(1 + x^{-1/2}\right)^{-1/3} + C$

B. $3\left(1+x^{-1/2}\right)^{-2/3}+C$

C. $3\left(1+x^{1/2}\right)^{-1/3}+C$

D. none of these

Answer: B

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15. Negation of the proposition $(p \vee (-q)) \vee (q)$ is equivalent to

A. $(\sim p \vee q) \wedge q$

B. $\sim p \wedge q$

C. A contradiction

D. A tautology

Answer: C

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16. If A lies in the third quadrant and 3tanA – 4= 0, then find the value of 5 sin 2 A + 3sin A + 4 cosA

A. 0

B. 1

C. 2

D. none of these

Answer: A

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17. Number of solutions of the equation $(2\text{cosec x} - 1)^{1/3} + (\text{cosec x} - 1)^{1/3}$ in $= 1(-k\pi, k\pi)$ is 16, then possible value of' k' is

A. ϕ

B. 4

C. 8

D. 16

Answer: D

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18. The value of $\lim_{x \to 2} \left(\frac{\cos^x \theta + \sin^x \theta - 1}{x - 2}\right)$ is equal to

A. $\cos^2 \theta \ln \cos \theta - \sin^2 \theta \ln \sin \theta$

B. $\cos^2\theta \ln \cos\theta + \sin^2\theta \ln \sin\theta$

C. $\cos^2\theta \ln \sin\theta + \sin^2\theta \ln \cos\theta$

D. $\cos^2\theta \ln \sin\theta - \sin^2\theta \ln \cos\theta$

Answer: B

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19. Number of values of x satisfying the equation $\sin^{-1} x^2 = \cos^{-1}(x^2 - 1)$ is

A. 5

B. 4

C. 3

D. 2

Answer: D

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20. At the foot of the mountain, the elevation of its summit is 45° , after ascending 1000 m towards the mountain up a slope of 30° inclination, the elevation is found to be 60° . The height of the mountain is

A. $\frac{\sqrt{3}+1}{2}m$

B. $\frac{\sqrt{3}-1}{2}m$

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

D. none of these

Answer: A

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21. The vector $\overrightarrow{P} = a\hat{i} + \beta\hat{i} + \gamma\hat{k}, a \neq 0$, lies in the plane of the vector $\overrightarrow{Q} = \hat{i} + \hat{j}$ and $\overrightarrow{R} = \hat{i} + \hat{k}$ and bisects the acute angle between $\overrightarrow{Q}$ and $\overrightarrow{R}$ Then the value of $\dfrac{3\beta + 4\gamma}{2\alpha}$ is

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22. In the binomial expansion of $\left(1 - \frac{1}{x} + 3x^5\right)\left(2x^2 - \frac{1}{x}\right)^8$ the term independent of x is

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23. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$ then find the value of

$$\begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$$

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24. If three students A, B, C independently solve a problem with Probabilities, $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{5}$ respectively, then the probability that the problem will be solved is

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25. Consider the polynomial equation:

$(1-P)\left(1+3x+9x^2+27x^3+81x^4,\ +243x^5\right)=1-P^6, P \neq 1$

then find the value of $\frac{P}{x}$

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26. Two vectors are given as $\vec{a} = \hat{i} + \hat{j} + \hat{k} \& = \vec{b} = x_1\hat{i} + x_2\hat{j}$ with $+ x_3\hat{k} x_1, x_2, x_3 \in \{-3, -2, -1, 0, 1, 2\}$. If the number of possible vectors $\vec{b}$ such that $\vec{a}$ and $\vec{b}$ are mutually perpendicular is p, then the value of $\frac{p}{5}$ is

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27. Let $f: R \to R$ be a function such that $f(x) = \begin{cases} [x] & x \leq 2 \\ 0 & x > 2 \end{cases}$ where [x] denotes the greatest integer function. If $I = \int_{-1}^{2} \frac{x.\, f(x^2)}{f(x+1)+2} dx$ then the value of 2I = _______

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28. The mean marks obtained by 300 students in Mathematics are 45. The mean of top 100 Students was 70 and the mean of last 100 was known to be 20. The mean of remaining 100 students is

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29. Consider the ellipse $\frac{x^2}{f(k^2-4k+6)}+\frac{y^2}{f(k+12)}=1$ where f(x) is a positive decreasing function. The number of integral non-negative values of k for which major axis lies on the line y = 0 is

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30. Find the value of $\left[\frac{1}{2}+\frac{1}{1000}\right]+\left[\frac{1}{2}+\frac{2}{1000}\right]+\ldots\ldots+\left[\frac{1}{2}+\frac{999}{1000}\right]$ if [.] represents the greatest integer function.

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