MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 88

Mathematics

1. The solution of the equation

$\left(\tan^2 x - 1\right)^{-1} = 1 + 2\cos 2x$ is

A. $x = n\pi - \frac{\pi}{2}$

B. $x = n\pi \pm \frac{\pi}{4}$

C. $x = n\pi \pm \frac{\pi}{3}$

D. $x = n\pi$

Answer: C

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2. Consider $f(x) = \begin{cases} -2, & -1 \leq x < 0 \\ x^2 - 2, & 0 \leq x \leq 2 \end{cases}$ and $g(x) = |f(x)| + f(|x|)$. Then, in the interval $(-2, 2)$, $g(x)$ is

A. not differentiable at one point

B. differentiable at all points

C. not continuous

D. not differentiable at two points

Answer: A

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3. The differential equation of the family of curves $y = k_1 x^2 + k_2$ is given by (where, k_1 and k_2 are arbitrary constants and $y_1 = \frac{dy}{dx}, y_2 = \frac{d^2y}{dx^2}$)

A. $y_1 = x^2 y_2$

B. $(y_1)^2 = xy_2$

C. $xy_2 = y_1$

D. $y_1 y_2 = x$

Answer: C

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4. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \sin^{-1}\left(\frac{2b}{1+b^2}\right) = 2\cot^{-1}\left(\frac{1}{x}\right)$, then x is equal to $[\forall a, b \in (0,1)]$

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

B. $\frac{b}{1+ab}$

C. $\frac{b}{1-ab}$

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

Answer: D

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5. Let the incentre of ΔABC is $I(2,5)$. If $A=(1,13)$ and $B=(-4,1)$, then the sum of the slopes of sides AC and BC is

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

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

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

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

Answer: B

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6. Let there are 4 sections of 25 students each in a coaching class. Now, out of 150 students 100 are to be selected randomly and entrolled in these sections. Then, the probability that the students A

and B (both present in 150 students) are selected and placed in the same section, is

A. $\frac{10}{13}$

B. $\frac{16}{149}$

C. $\frac{2}{33}$

D. $\frac{5}{149}$

Answer: B

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7. If the equation of the plane passing through $(1, 2, 3)$ and situated at a maximum distance from point $(2, 3, 4)$ is P = 0, then the distance (in units) of P = 0 from origin is

A. $\sqrt{3}$

B. $2\sqrt{3}$

C. $\sqrt{6}$

D. $3\sqrt{2}$

Answer: B

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8. Consider the matrix $A = \begin{bmatrix} x & 2y & z \\ 2y & z & x \\ z & x & 2y \end{bmatrix}$ and $AA^T = 9I$. If $Tr(A) > 0$ and $xyz = \frac{1}{6}$, then the vlaue of $x^3 + 8y^3 + z^3$ is equal to (where, $Tr(A), I$ and A^T denote the trace of matrix A i.e. the sum of all the principal diagonal elements, the identity matrix of the same order of matrix A and the transpose of matrix A respectively)

A. 20

B. 22

C. 26

D. 28

Answer: D

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9. If

$\left(1+x+x^2\right)^{25} = a_0 + a_1 x + a_2 x^2 + \ldots . + a_{50} . x^{50}$

then $a_0 + a_2 + a_4 + \ldots + a_{50}$ is :

A. even

B. odd and the form 3n

C. odd and of the form $(3n-1)$

D. odd and of the form $(3n+1)$

Answer: A

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10. A student has to answer 10 out of 13 questions in an examination. The number of ways in which he can answer if he must answer atleast 3 of the first five questions is 276 b. 267 c. 80 d. 1200

A. 276

B. 600

C. 840

D. 640

Answer: A

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11. If $\tan\theta = 3\tan\phi$, then the maximum value of $\tan^2(\theta - \phi)$ is

A. 1

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

C. 2

D. 4

Answer: B

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12. Consider a relation R defined as aRb if $2 + ab > 0$ where a, b are real numbers. Then, the relation R is

A. reflexive and symmetric

B. symmetric and transitive

C. transitive and reflexive

D. None of these

Answer: A

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13. The length of the longest interval in which the function $f(x) = x^3 - 3a^2x + 4$ is decreasing is $(\forall a > 0)$

A. a

B. 2a

C. 3a

D. 4a

Answer: B

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14. The integral $I = \int \left(e^{\left(e^{\sin x} + \sin x \right)} \right) \cos x dx$ simpllifies to (where, c is the constant of integration)

A. $e^{\sin x} + c$

B. $e^{\sin x + \cos x} + c$

C. $e^{e^{\cos x}} + c$

D. $e^{e^{\sin x}} + c$

Answer: D

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15. The mean and variance of 7 observations are 7 and 22 respectively. If 5 of the observations are 2, 4, 10, 12, 14, then the remaining 2 observations are

A. 4, 3

B. 2, 5

C. 6, 1

D. 4, 2

Answer: C

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16. The maximum area (in sq. units) bounded by $y = \sin x, y = ax(\forall a \in [1, 4])$ and then line $\pi - 2x = 0$ is

A. π^2

B. $\frac{\pi^2}{2} - 1$

C. $\pi + 2$

D. $\pi^2 - 4$

Answer: B

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17. If z_1, z_2, z_3 are 3 distinct complex such that $\frac{3}{|z_1 - z_2|} = \frac{5}{|z_2 - z_3|} = \frac{7}{|z_3 - z_1|}$, then the value of $\frac{9\bar{z}_3}{z_1 - z_2} + \frac{25\bar{z}_1}{z_2 - z_3} + \frac{49\bar{z}_2}{z_3 - z_1}$ is equal to

A. 0

B. 1

C. -1

D. 15

Answer: A

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18. The line $2x + y = 3$ cuts the ellipse $4x^2 + y^2 = 5$ at points P and Q. If θ is the acute angle between the normals at P and Q, then θ is equal to

A. $\tan^{-1}\left(\frac{4}{5}\right)$

B. $\sin^{-1}\left(\frac{3}{\sqrt{34}}\right)$

C. $\cos^{-1}\left(\frac{3}{\sqrt{34}}\right)$

D. $\cot^{-1}\left(\frac{3}{4}\right)$

Answer: C

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19. Let $\vec{a} = x^2\hat{i} - 3\hat{j} + (x-3)\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - (x-3)\hat{k}$ be two vectors such that $|\vec{a}| = |\vec{b}|$. If angle between $4\vec{a} + 7\vec{b}$ and $7\vec{a} - 4\vec{b}$ is equal to θ. Then $\cos 2\theta$ is equal to

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

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

C. -1

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

Answer: C

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20. Let D is a point on the line $l_1 : x + y - 2 = 0$, $S(3, 3)$ is a fixed point and line l_2 is the perpendicular to DS and passing through S. If MK is another point on the line l_1 (other than D), then the locus of the point of intersection of l_2 and angle bisector of the angle MDS is a conic whose length of latus rectus rectum is equal to

A. $4\sqrt{2}$

B. 4

C. 8

D. $2\sqrt{2}$

Answer: A

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21. The value of $\lim_{x \to 2\pi} \frac{\cos x - (\cos x)^{\cos x}}{1 - \cos x + \ln(\cos x)}$ is equal to

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22. Let A be a non - singular matrix of order 3 such that $Aadj(3A) = 5AA^T$, then $\sqrt[3]{\left|A^{-1}\right|}$ is equal to

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23. If $f(n+1) = \frac{2f(n)+1}{2}$ for $n = 1, 2, 3. \ldots \ldots \ldots$ and $f(1) = 2$, then $\frac{f(101)}{10}$ is equal to

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24. If the integral $I = \int_0^{19\pi} \frac{dx}{1+e^{\cos^3 x}}$ has the value, $\frac{k\pi}{2}$, then $\frac{k}{2}$ is equal to

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25. The line $L_1 \equiv 3x - 4y + 1 = 0$ touches the circles C_1 and C_2. Centers of C_1 and C_2 are $A_1(1, 2)$ and $A_2(3, 1)$ respectively Then, the length (in units) of the transverse common tangent of C_1 and C_2 is equal to

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