MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 45

Mathematics

1. If the inequality $x^2 + ax + a^2 + 6a < 0$ is satisfied for all $x \text{ in } (1, 2)$, then the sum of all the integral values of a must be equal to

A. -10

B. -15

C. -21

D. -28

Answer: C

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2. The number of integral terms in the expansion of $\left(5^{\frac{1}{6}}+7^{\frac{1}{9}}\right)^{1824}$ is

A. 84

B. 96

C. 91

D. 102

Answer: D

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3. If the sum of the root of the equation $\cos 4x+6+7\cos 2x$ in the interval [0,314] is $k\pi$, $k\in R$ Find (k-4948)

A. 4950

B. 2475

C. 9900

D. 4945

Answer: A

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4. If $A(0, 0), B(\theta, \cos\theta)$ and $C(\sin^3\theta, 0)$ are the vertices of a triangle Abc, then the value of θ for which the triangle has the maximum area is $\left(\text{where } \theta \in \left(0, \frac{\pi}{2}\right)\right)$

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

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

D. $\frac{\pi}{2}$

Answer: C

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5. The value of $\int_0^{\frac{\pi}{3}} \log\left(1+\sqrt{3}\tan x\right)dx$ is equal to

A. $\pi \log 2$

B. $\frac{\pi}{2}\log 2$

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

D. $\frac{\pi}{4}\log 2$

Answer: C

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6. The area (in sq. units) enclosed between the curve $x = \frac{1-t^2}{1+t^2}, y = \frac{2t}{1+t^2}, \forall t \in R$ and the line $y = x + 1$ above the line is

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

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

C. $\frac{3\pi}{4} + \frac{1}{2}$

D. $\frac{\pi}{4} - \frac{1}{2}$

Answer: D

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7. The solution of the differential equation

$y\left(2x^4 + y\right)\frac{dy}{dx} = \left(1 - 4xy^2\right)x^2$ is given by

A. $3x^2y + x^3 - y^3 = C$

B. $3x^4y^2 + y^3 - x^3 = C$

C. $3x^2y^4 + x^3 - y^3 = C$

D. $3x^2y^3 - x^3 = C$

Answer: B

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8. $R \to R$ be defined by $f(x) = \frac{\left(e^{2x} - e^{-2x}\right)}{2}$. is $f(x)$ invertible. If yes then find $f^{-1}(x)$

A. f is many - one

B. f is into

C. $f^{-1}(x) = \frac{1}{2}\left[\log\left(x - \sqrt{x^2+1}\right)\right]$

D. $f^{-1}(x) = \frac{1}{2}\left[\log\left(x + \sqrt{x^2+1}\right)\right]$

Answer: D

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9. The value of $\lim_{x \to 1} \frac{x \tan\{x\}}{x - 1}$ is equal to (where $\{x\}$ denotes the fractional part of x)

A. -1

B. 0

C. 1

D. Does not exist

Answer: D

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10. If the lines $\frac{x-1}{1}=\frac{y-3}{1}=\frac{z-2}{\lambda}$ and $\frac{x-1}{\lambda}=\frac{y-3}{2}=\frac{z-4}{1}$ intersect at a point, then the value of λ^2+4 is equal to

A. 8

B. 10

C. 13

D. 5

Answer: A

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11. Let A and B are square matrices of order 2 such that $A + adj(B^T) = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ and $A^T - adj(B) = \begin{bmatrix} -2 & -1 \\ -1 & -1 \end{bmatrix}$, then $A^2 + 2A^3 + 3A^4 + 5A^5$ is equal to (where M^T and adj(M) represent the transpose matrix and adjoint matrix of matrix M respectively and I represents the identity matrix of order 2)

A. 4A

B. 7A

C. 11A

D. 10I

Answer: C

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12. A bag contains 40 tickets numbered from 1 to 40. Two tickets are drawn from the bag without replacement. The probability that the 2^{nd} ticket is a perfect square given that the 1^{st} ticket was a perfect square is

A. $\frac{1}{6}$

B. $\frac{5}{39}$

C. $\frac{3}{20}$

D. $\frac{1}{8}$

Answer: B

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13. Let A and B be two square matrices of order 3 such that $|A| = 3$ and $|B| = 2$, then the value of $\left|A^{-1}.\, adj\left(B^{-1}\right).\, adj\left(2A^{-1}\right)\right|$ is equal to (where adj(M) represents the adjoint matrix of M)

A. 72

B. $\frac{64}{27}$

C. $\frac{8}{9}$

D. $\frac{16}{27}$

Answer: D

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14. Point $P(-1, 7)$ lies on the line $4x + 3y = 17$. Then the coordinates of the points farthest from the line which are at a distance of 10 units from the point P are

A. $(7, 13)$ and $(-9, 1)$

B. $(5, 15)$ and $(-1, -7)$

C. $(-1, 5)$ and $(15, -7)$

D. $(15, 5)$ and $(-7, -1)$

Answer: A

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15. From the point A(0, 3) on the circle $x^2 + 9x + (y-3)^2 = 0$, a chord AB is drawn and extended to a point M such that AM = 2AB (B lies between A & M). The locus of the point M is

A. $x^2 + 18x + y^2 = 0$

B. $x^2 + 18x + (y-3)^2 = 0$

C. $(x-3)^2 + 18x + y^2 = 0$

D. $x^2 + 8x + 18 - y^2 = 0$

Answer: B

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16. OA is the chord of the parabola $y^2 = 4x$ and perpendicular to OA which cuts the axis of the parabola at C. If the foot of A on the axis of the parabola is D, then the length CD is equal to

A. 2 units

B. 3 units

C. 4 units

D. 6 units

Answer: C

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17. If $A(2+3i)$ and $B(3+4i)$ are two vertices of a square ABCD (taken in anticlockwise order)in a complex plane, then the value of $|Z_3|^2 - |Z_4|^2$ (Where C is Z_3 and D is Z_4) is equal to

A. 0

B. 6

C. 8

D. 12

Answer: D

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18. Two poles of height 10 meters and 20 meters stand at the centres of two circular plots which touch each other externally at a point and the two poles subtend angles $30^\circ \text{ and } 60^\circ$ respectively at this point, then the distance between the centres of these circular plots is

A. 30 meters

B. $\frac{50}{\sqrt{3}}$ meters

C. $\frac{70}{\sqrt{3}}$ meters

D. $\left(10\sqrt{3}+20\right)$ meters

Answer: B

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19. If in a class there are 200 students in which 120 take Mathematics, 90 take Physics, 60 take Chemistry, 50 take Mathematics & Physics, 50 take

Mathematics & Chemistry, 43 take Physics & Chemistry and 38 take Mathematics Physics & Chemistry, then the number of students who hace taken exactly one subject is

A. 42

B. 56

C. 270

D. 98

Answer: D

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20. If the variance of first n even natural numbers is 133, then the value of n is equal to

A. 19

B. 24

C. 21

D. 20

Answer: D

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21. The arithmetic mean of two positive numbers a and b exceeds their geometric mean by $\frac{3}{2}$ and the geometric mean exceeds their harmonic mean by $\frac{6}{5}$. If $a+b=\alpha$ and $|a-b|=\beta$, then the value of $\frac{10\beta}{\alpha}$ is equal to

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22. If P and Q are points with eccentric angles θ and $\left(\theta+\frac{\pi}{6}\right)$ on the ellipse $\frac{x^2}{16}+\frac{y^2}{4}=1$, then the area (in sq. units) of the triangle OPQ (where O is the origin) is equal to

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23. If $\vec{x}$ and $\vec{y}$ are two non zero, non - collinear vectors satisfying

$\left((a-3)\alpha^2+(b-4)\alpha+(c-1)\right)\vec{x}+\left[(a-3)\beta^2+(b-4)\beta+(c-1)\right]\vec{y}$

(where α, β, γ are three distinct numbers), then the value of $\frac{a^2+b^2+c^2}{4}$ is equal to

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24. $\int \frac{(\cos x)^4}{(\sin x)^3\left((\sin x)^5+(\cos x)^5\right)^{\frac{3}{5}}}$ dx

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25. If $f(x)=\begin{cases}\frac{e^{\left(1+\frac{1}{x}\right)}-a}{e^{\frac{1}{x}}+1} & : x\neq 0\\ b & : x=0\end{cases}$ (where a and b are arbitrary constants) is continuous at x = 0, then the value of a^2 is equal to

(use e = 2.7)

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