MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 55

Mathematics Single Choice

1. $\sin^{-1}\left(\sin\left(\frac{\tan^{-1}1+\tan^{-1}2+\tan^{-1}3}{\cot^{-1}1+\cot^{-1}2+\cot^{-1}3}\right)\right)=$

A. 0

B. $\pi-2$

C. $2-\pi$

D. 2

Answer: A

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2. Let $f: R \to R$ be a differentiable function given by $f(x) = x^3 - 3x + 2020$ If g(x) is a continuous function defined by

$$g(x) = \begin{cases} \text{Minimum}\{f(t), 0 \leq t \leq x\}, & 0 \leq x \leq 1 \\ \text{Mzximum}\{f(t), 1 < t \leq x\}, & 1 < x \leq 2 \end{cases}$$

and m and M be the least and the greatest value of g(x) on [0, 2] then which one of the following is correct?

A. $M - m = 2$

B. $m = 2020$

C. $M = 2022$

D. $m = 2019$

Answer: C

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3. The number of 5 digit numbers which are divisible by 3, using digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 when repetition of digit is allowed is :

A. 3^9

B. 4.3^8

C. 5.3^8

D. 7.3^8

Answer: A

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4. Let AB and CD are two parallel chords of circle whose radius is 5 units. If P and Q are mid points of AB and CD respectively such that PA. PB = 9, QC. QD = 16, then distance between AB and CD is

A. 5

B. 25

C. 7

D. 11

Answer: C

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5. ABCD is a rectangular field. A vertical lamp post of height 12 m stands at the corner A. If the angle of elevation of its top from B is 60° and from C is 45°, then the area of the field is

A. $48\sqrt{2}$ sq m

B. $48\sqrt{3}$ sq m

C. 48 sq m

D. $12\sqrt{2}$ sq m

Answer: A

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6. The negation of $p \to (-p \vee q)$ is

A. $p \vee (p \vee -q)$

B. $p \to -(p \vee q)$

C. $p \to q$

D. $p \wedge -q$

Answer: D

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7. The value of $\int_0^2 \frac{dx}{2^{2x}+4}$ is

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

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

C. 2

D. 1

Answer: A

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8. If the tangents on the ellipse $4x^2 + y^2 = 8$ at the points (1, 2) and (a,b) are perpendicular to each other, then a^2 is equal to :

A. $\frac{64}{17}$

B. $\frac{2}{17}$

C. $\frac{128}{17}$

D. $\frac{4}{17}$

Answer: B

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9. The solution of the differential equation $\frac{x+\frac{x^3}{3!}+\frac{x^5}{5!}+}{1+\frac{x^2}{2!}+\frac{x^4}{4!}+}=\frac{dx-dy}{dx+dy}$ is

A. $2ye^{2x}=Ce^{2x}+1$

B. $2ye^{2x}=Ce^{2x}-1$

C. $ye^{2x}=Ce^{2x}+2$

D. None of these

Answer: B

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10. Consider three vectors $\vec{v}_1=\vec{v}_2-\vec{v}_3, \vec{v}_1, \vec{v}_2$ and $\vec{v}_3$ such that If $\vec{v}_1=\left(\vec{a}\times\hat{i}\right)\times\hat{i}, \vec{v}_2=\left(\vec{a}\times\hat{j}\right)\times\hat{j}$ and $\vec{v}_3=\left(\vec{a}\times\hat{k}\right)\times\hat{k}$, where $\vec{a}$ is non -zero vector then :-

A. $\vec{a}\cdot\hat{j}=0$

B. $\vec{a} \cdot \hat{i} = 0$

C. $\vec{a} \cdot \hat{k} = 0$

D. $\vec{v}_1 \cdot \vec{v}_2 = \left(\vec{a} \cdot \hat{j}\right)^2$

Answer: A

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11. Three numbers whose sum is 18 are in A. P. If they are added by $6, \frac{2}{2}$ and 3 respectively, then the are in G. P. Then sum of square of numbers is

A. $\frac{379}{4}$

B. $\frac{445}{4}$

C. $\frac{225}{2}$

D. $\frac{99}{2}$

Answer: C

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12. Find the standard deviation of 10 observations

111, 211, 311,..., 1011

A. $100\sqrt{3}$

B. 250

C. 300

D. $50\sqrt{33}$

Answer: D

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13. The length of a line segment whose length of projections on coordinate planes are 1, 2 and 2

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

B. $3\sqrt{2}$

C. 3

D. 6

Answer: A

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14. Distance of point A (1,2) measured parallel to the line $3x - y = 10$ from the line x + y + 5 = 0, is

A. $2\sqrt{5}$

B. $2\sqrt{10}$

C. $4\sqrt{5}$

D. $4\sqrt{10}$

Answer: B

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15. If a, b, c are distinct and rational numbers then

$$\begin{vmatrix} (a^2+b^2+c^2) & ab+bc+ca & ab+bc+ca \\ ab+bc+ca & (a^2+b^2+c^2) & (ab+bc+ca) \\ ab+bc+ca & (ab+bc+ca) & (a^2+b^2+c^2) \end{vmatrix}$$

is always

A. zero

B. Rational & Positive

C. Rational & Negative

D. Irrational and Positive

Answer: B

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16. If A lies in the third quadrant and 3tan A – 4= 0, then find the value of

$5\sin 2A + 3\sin A + 4\cos A$

A. 0

B. 1

C. 2

D. none of these

Answer: A

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17. Area bounded by $y = \tan^{-1} x$, $y = \cot^{-1} x$ and y-axis is equal to

A. ln $\sqrt{2}$ sq. unit

B. ln 4 sq. unit

C. ln 8 sq. unit

D. ln 2 sq. unit

Answer: D

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18. If $a_1, a_2, \ldots, a_n$ are real numbers with $a_n \neq 0$ and $\cos\alpha + i\sin\alpha$ is a root of $z^n + a_1 z^{n-1} + a_2 z^{n-2} + \ldots + a_{n-1}z + a_n = 0$ then the sum $a_1\cos\alpha + a_2\cos 2\alpha + a_3\cos 3\alpha + \ldots + a_n\cos n\alpha$ is

A. 0

B. 1

C. -1

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

Answer: C

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19. The coefficient of x^{20} in $(1+x)(1+2x)(1+4x)(1+8x)\ldots\left(1+2^{20}x\right)$ is

A. $2^{211} - 2^{190}$

B. $2^{191} - 2^{171}$

C. $2^{231} - 2^{209}$

D. $2^{161} - 2^{142}$

Answer: A

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20. $\lim_{x \to \infty} ((x+5)\tan^{-1}(x+5) - (x+1)\tan^{-1}(x+1)$ is equal to

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

B. π

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

D. 2π

Answer: D

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Mathematics Subjective Numerical

1. Let f be a continuous and differentiable function in (x_1, x_2). If $f(x).\, f'(x) \geq x\sqrt{1-(f(x))^4}$ and $\lim_{x \to x_1^+} (f(x))^2 = 1$ and $\lim_{x \to x_2^-} (f(x))$ then minimum value of $x_1^2 - x_2^2$ is λ then $\frac{\lambda}{\pi}$ equals to .....

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2. If 'A' is a square matrix of order 3 $\times$ 3 and det(A) $= \frac{1}{2}$, then det (Adj A^{-1}) is

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3. Let y = f(x) is an invertible function satisfying $f(1) = 5, f'(1) = 2, f''(1) = 4,$ then the absolute value of $2.\left(f^{-1}\right)''(5)$ is equal to

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4. A curve is represented by the equations, $x = \sec^2 t$ and y = cot t where t $\in$ R is a parameter. If the tangent at the point $P(t = \pi/4)$ on the curve meets the curve again at the point Q (m,n), then the value of m is:

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5. The equation $x^2 + bx + c = 0$ has distinct roots. If 2 is subtracted from each root, then the result is the reciprocal of original root, then $b^2 + c^2$ is

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6. The number of non-differentiability points of function f defined as f(x) = max · (||x| - 2|,1) is equal to

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7. The domain of $f(x) = \left\{\log_{\left(\frac{x^2-12x+30}{10}\right)}\left(\log_2\left(\frac{2x}{5}\right)\right)\right\}^{-\frac{1}{2}}$ is $\left(\frac{a}{2}, b-\sqrt{b}\right) \cup (c, \infty)$, where $a, b, c \in N$, then the value of a+b+c is equal to

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8. A card from a pack of 52 cards is lost. From the remaining cards of the pack two cards are drawn and found to be hearts. If the probability that lost card is hearts, is k, then the value of 100 k is

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9. Let A = {1, 3, 8, 9), let L denotes number of relations on set A, which are antisymmetric and M denotes number of relations on set A, which are both reflexive and antisymmetric, then the value of $\frac{L}{M}$ is equal to

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10. How many solution does the equation

$\cos^{10} x - \sin^{10} x = 1 \text{ in } [-3\pi, 3\pi]$ have?

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