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MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 38

Mathematics

1. If the 9^{th} term in the expansion of $\left(\frac{1}{x^2}+\frac{x}{2}\log_2 x\right)^{12}$ is equal to 495, then the sum of all possible values of x is

A. 4

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

C. $\frac{15}{4}$

D. 8

Answer: B

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2. If z is a complex number such that $arg z(1+\bar{z}) + arg\left(\frac{|z|^2}{z-|z^2|}\right) = 0$, then

A. $arg\bar{z} = -\frac{\pi}{2}$

B. $arg z = \frac{\pi}{4}$

C. $|\bar{z}| < 1$

D. In $\left(\frac{1}{|z|}\right) \in (-\infty, \infty)$

Answer: C

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3. Consider the system of equations in x,y,z as $x\sin 3\theta - y + z = 0, x\cos 2\theta + 4y + 3z = 0, 2x + 7y + 7z = 0$. If this system has a non -trivial solution, then for integer n, values of θ are given by

A. $\pi\left(n + \frac{(-1)^{1/2}}{3}\right)$

B. $\pi\left(n + \frac{(-1)^{1/2}}{4}\right)$

C. $\pi\left(n + \frac{(-1)^{1/2}}{6}\right)$

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

Answer: C

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4. For a square matrix P satisfying the realation $P^2 = I - P$, where I is an identity matrix, and if $P^n = 5I - 8P$ then the value of n is :4

A. 4

B. 5

C. 6

D. 7

Answer: C

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5. Let t_n be n^{th} term of a geometric progression with common ratio r. If $r < 0, \frac{t_6}{t_8} = \frac{1}{4}$ and $t_3 + t_7 = 100$ and $t_1 = \frac{a}{b}$, then the value of $a + b$ is (a and b are coprime numbers).

A. 37

B. 83

C. 50

D. 42

Answer: D

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6. Two finite sets A and B have p and q elements respectively. If total number of subsets of set A is 56 more that total number of subsets of set B, then

A. $p \cdot q = 12$

B. $p + q = 8$

C. $p - q = 3$

D. $p = 3q$

Answer: C

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7. Number of points from which pair of perpendicular tangents can be drawn to hyperbola

$x^2 \cos ec^2\alpha - y^2 \sec^2\alpha = 1, \quad \text{is} \quad \alpha \in \left(0, \frac{\pi}{4}\right)$

A. 0

B. 1

C. 2

D. infinite

Answer: A

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8. A line perpendicular to the oin of the points $\left(\frac{11}{3}, 0\right)$ and $\left(0, \frac{11}{4}\right)$, and which is tangent to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is _____.

A. $4x - 3y = \pm 6\sqrt{5}$

B. $4x - 3y = \pm \sqrt{12}$

C. $4x - 3y = \pm \sqrt{2}$

D. $4x - 3y = \pm 1$

Answer: A

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9. The locus of the centroid of triangle PSQ, where PQ is any chord of the parabola $y^2 = 8(x + 2)$ subtending right angle at the vertex and S be its focus is also a parabola whose latus rectum is equal to

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

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

C. $\frac{8}{3}$

D. 2

Answer: C

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10. The locus of the of perpendicular from (1,2) on each member of the family of lines

$(1+2t)x+(1-t)y+t-1=0, t \in R$ is

A. $x^2+y^2+x-3y+2=0$

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

C. $x^2+y^2-x-3y-4=0$

D. None of these

Answer: B

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11. Maximum value of the function $f(x)=x^{\frac{1}{x}}$ is _____.

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

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

C. e

D. $e^{\frac{1}{e}}$

Answer: D

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12. The length of the perpendicular drawn from the point (2,1,4) to the plane containing the lines $\vec{r} = \left(\hat{i} + \hat{j}\right) + \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $\vec{r} = \left(\hat{i} + \hat{j}\right) + \mu\left(-\hat{i} + \hat{j} - 2\hat{k}\right)$

A. $\sqrt{3}$

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

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

D. 3

Answer: A

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13. The value of $g'(-4)$ if $f(x) = x^5 + 2x - 4$ and $g(x)$ is inverse of f(x) is [Where g'(x) denotes derivative of g(x)]`

A. $\frac{35}{16}$

B. $\frac{37}{16}$

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

D. $-\frac{4}{16}$

Answer: C

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14. Find the value of f(100), if f is a real valued function such that $f(x+y) = f(x) + f(y)$ and $f(1) = 5$.

A. 200

B. 300

C. 400

D. 500

Answer: D

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15. A continuous function $f: R \to R$ satisfies the differential equation $f(x) = \left(1 + x^2\right)\left[1 + \frac{f_0^x\left((f(t))^2\right)}{1 + t^2}dt\right], then f(-3)$ is

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

B. $\frac{8}{5}$

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

D. $\frac{5}{8}$

Answer: C

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16. $f \cos(9x) \cdot \cos^7 x dx$ equals

A. $\frac{\sin(8x) \cdot \sin^8 x}{8} + c$

B. $\frac{\sin(8x) \cdot \cos^8 x}{8} + c$

C. $\frac{\cos(8x) \cdot \sin^8 x}{8} + c$

D. $\frac{\cos(8x) \cdot \cos^8 x}{8} + c$

Answer: B

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17. If a positive integer n is divisible by 9 then the sum of the digits of n is divisible by 9. which of the following statement is its contrapositive.

A. (sum of digits of n is divisible by 9) $\Rightarrow$ (n is divisible by 9)

B. (sum of digits of n is not divisible by 9) $\Rightarrow$ (n is not divisible by 9)

C. (sum of digits of n is divisible by 9) $\Rightarrow$ (n is not divisible by 9)

D. None of these

Answer: B

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18. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observations of the set is increased by 2, then the median of the new set

A. Is increased by 2

B. Is decreased by 2

C. is two time the original median

D. remains same

Answer: D

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19. The number of distinct real roots of the equation $\left(\log_{sqr3} \tan x\right)\left(\sqrt{\log_{\sqrt{3}} 3\sqrt{3} + \log_{\tan x} 3}\right) = -1$ in interval [0,2pi]`

A. 0

B. 2

C. 4

D. 6

Answer: B

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20. If $f(x) = \dfrac{\sqrt{x} + 7 - 4}{x - 9}$, then range of $y = \cos^{-1}(4f(x))$ is

A. $\left[0, \dfrac{\pi}{2}\right)$

B. $\left(0, \dfrac{\pi}{2}\right]$

C. $\left[0, \frac{\pi}{2}\right) - \left\{\frac{\pi}{3}\right\}$

D. $\left[0, \frac{\pi}{2}\right) - \left\{\frac{\pi}{6}\right\}$

Answer: C

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21. The number of different nine digit numbers that can be formed by using the digits from the number 223355888 by rearranging its digits so that the odd digits always occupy even position are k then $\frac{k}{10}$ = ____

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22. Find the sum of all the values of a so that the equation $\left(x^2 + 2ax + 2a + 3\right)\left(x^2 + 2ax + 4a + 5\right) = 0$ has only 3 real distinct roots

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23. If $\vec{a}, \vec{b}$ are vectors perpendicular to each other and $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3, \vec{c} \times \vec{a} = \vec{b}$ then the least value of $\left|\vec{c} - \vec{a}\right|$ is

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24. The value of $\lim_{x \to 2} \frac{x - 2}{\sqrt{1 + \sqrt{2 + x}} - \sqrt{3}}$ is equal to (take $\sqrt{3} = 1.73$)

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25. Let f be a continuous & even function such that $f_0^a f(x)dx = 10.$ if $g(x)$ is a continuous positive function such that $g(x)g(-x) = 1$ and $\int_0^a g(x)dx = 5$ then find the value of $\int_{-a}^{a} \frac{f(x)}{1 + g(x)}dx.$

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26. A consignment of 15 washing machines contains 4 defective ones. The washing machine are selected one by one and examinde. The examined ones are not restored. If the probability of 9^{th} one examined is the last defective is $\frac{a}{b}$ (where a and b are co-prime), then the value of $\frac{b-3}{a}$ is

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27. Let $f(x) = [x]^2 - [x^2], x \in [-2, 2] where [\cdot]$ represents greatest integet function. If m, k represent the number of irrational values of x at which f is not differentiable and the number of integral values of x at which f is continuous respectively, then the value of m-k is equal to

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28. Let the area of the region bounded by the curves be $y^3 = x^2$ and $y = 2 - x^2$ be $\frac{30+\lambda}{15} sq.$ units , then λ equals

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29. Let

$X = \left({}^{10}C_1\right)^2 + 2\left('\hat{}(10)C\_2)\hat{}2+3(\,{}^{10}C_3\right)^2 + \ldots,$ where $+ 10\left({}^{10}C_{10}\right)^2$

${}^{10}C_r, r \in \{1, 2, \ldots., 10\}$ denote binomial coefficients. Then , the value of 1/1430 X` is _ _ _ _ _ ,

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30. If

$\sin x + \sin y = \frac{3}{4}$ and $\cos x + \cos y = -\frac{1}{4}$ then evaluate $\tan(x+y)$

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