MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 53

Mathematics

1. Let x_1 and y_1 be real numbers. If z_1 and z_2 are complex numbers such that

$|z_1| = |z_2| = 4,$ then

$|x_1 z_1 - y_1 z_2|^2 + |y_1 z_1 + x_1 z_2|^2 =$

A. $32\left(x_1^2 + y_1^2\right)$

B. $16\left(x_1^2 + y_1^2\right)$

C. $4\left(x_1^2 + y_1^2\right)$

D. $8\left(x_1^2+y_1^2\right)$

Answer: A

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2. Let A and B are two squar matrices of same order such that AB = B and BA = A , then A^2+B^2 is equal to

A. 2 AB

B. 2BA

C. A + B

D. AB

Answer: C

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3. $\sum_{r=1}^{10} \begin{vmatrix} 2r & 2r+1 \\ 110 & 120 \end{vmatrix}$ is equal to

A. 0

B. 20

C. 100

D. None

Answer: D

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4. If Letters A,A,A,M,N,R,Y are arranged in dictionary order then the word whose rank is 629^{th} is :

A. RAMAYAN

B. RAMAYNA

C. RAMAYANA

D. RMAAYNA

Answer: A

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5. Let

$$f(x) = \sin x + \cos x + \tan x + \sin^{-1} x. + \tan^{-1} x + \cos^{-1} x$$

If M and m are maximum and minimum vlaue of f (x), then its sum is

A. $\pi + 2\cos 1$

B. $\pi + 2\sin 1$

C. $\frac{\pi}{2} + 2\tan 1$

D. $\pi + \tan 1 + \sin 1$

Answer: A

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6. The radical centre of three circles described on the three sides $4x - 7y + 10 = 0, x + y - 5 = 0$ and $7x + 4y - 15 = 0$ of a triangle as diameters is

A. $(2, 1)$

B. $(1, 2)$

C. $(2, 3)$

D. $(-6, -2)$

Answer: B

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7. An ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the hyperbola $x^2 - y^2 = \frac{1}{2}$ intersect orthogonally. It is given that the eccentricity of the ellipse is reciprocal of that of hyperboa, then $\frac{a^2}{b^2}$ is equal to

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

B. 2

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

D. 4

Answer: B

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8. If A, B and C are ehaustive events satisfying $P\left((A \cup B) \cap \overline{C}\right) = \frac{1}{5}$, $P(B \cap C) - P(A \cap B \cap C) = \frac{1}{15}$ and $P(A \cap C) = \frac{1}{10}$ then $P\left(C \cap \left(\overline{A \cup B}\right)\right)$ is equal to

A. $\frac{17}{30}$

B. $\frac{18}{30}$

C. $\frac{19}{30}$

D. $\frac{20}{30}$

Answer: C

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9. The lines $2x + 3y = 6, 2x + 3y = 8$ cut the x-axis at A and B A line 'l' is drawn through the point (2,2) meets the x-axis at C in such a way that the abscissa of A, B and C are in geometric progression. The equation of the line 'l' is

A. $3x - 5y = 16$

B. $3x + 5y = 16$

C. $5x + 3y = 16$

D. $5x - 3y = 16$

Answer: B

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10. Consider $f:(0,1) \to R$ is given by $f(x) = \ln\left(1+\sqrt{1-x^2}\right)$.

Point $-\sqrt{1-x^2} - \ln x$

$A(h, f(h)), 0 < h < 1$ lies on curve and tangent at point A intersect the y-axis at point B (0,k). If distance between pointe A and B is d , then which of the following is correct ?

A. $d \propto h$

B. $d < 1$

C. $d = 1$

D. $d > 1$

Answer: C

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11. The value of

$$\left[\vec{A}-\vec{B}, \vec{B}-\vec{C}, \vec{C}-\vec{A}\right]$$ where

$$\left|\vec{A}\right|=1, \left|\vec{B}\right|=2 \text{ and } \left|\vec{C}\right|=3 \text{is}$$

A. 1

B. 6

C. 0

D. 3

Answer: C

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12. If $x=\int_0^y \frac{dt}{\sqrt{1+t^2}}$, then $\frac{d^2y}{dx^2}$ is equal to

A. y

B. $\sqrt{1+y^2}$

C. $\frac{x}{\sqrt{1+y^2}}$

D. y^2

Answer: A

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13. Let $f(x) = \frac{x - \{x+1\}}{x - \{x+2\}}$, where {x} is the fractional part of x, then $\lim_{x \to 1/3} f(x)$

A. has value 0

B. has value 1

C. has value $-\infty$

D. has value ∞

Answer: B

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14.

$$\lim_{n \to o} n\left\{\frac{1}{(n+1)(n+2)} + \frac{1}{(n+2)(+4)} + \frac{1}{(n+3)(n+6)} + \ldots =\right.$$

A. $\log\left(\frac{3}{2}\right)$

B. $\log\left(\frac{2}{3}\right)$

C. $\frac{1}{3}\log 2$

D. $\frac{1}{2}\log 3$

Answer: A

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15. If the tangent to the curve $y = e^{kx} at M(0, 1)$ meet the x-axis at N(a,0) where $a \in [-2, -1]$then k belong to

A. $\left[\frac{-1}{2}, 0\right]$

B. $\left[-1, \frac{-1}{2}\right]$

C. $[0, 1]$

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

Answer: D

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16. The value of $\int \frac{\cot x}{\sqrt{5+9\cot^2 x}} dx$ is equal to (where C is constant of integration.)

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

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

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

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

Answer: A

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17. The value of

$$\cot^4\frac{\pi}{16}-4\cot^3\frac{\pi}{16}-6\cot^2\frac{\pi}{16}is+4\cot\frac{\pi}{16}+2$$

A. 0

B. -1

C. 2

D. 1

Answer: D

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18. If $\theta_1,\theta_2,\theta_3\in[0,3\pi]$, then the number of ordered triplets $(\theta_1,\theta_2,\theta_3)$ which satisfy $\left(1+\cos ec^4\theta_1\right)\left(2+\cot^4\theta_2\right)(4+\sin 4\theta_3)\leq 12\sin^2\theta_1$ are

A. 18

B. 36

C. 72

D. 48

Answer: B

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19. The x satisfying

$\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x$ are

A. $1, 0$

B. $1, -1$

C. $0, \frac{1}{2}$

D. None of these

Answer: C

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20. Which of the following is a contradiction ?

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

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

C. $(p \Rightarrow q) \Rightarrow p$

D. None of these

Answer: A

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21. The postivie integer which is just greater than $(1+0.001)^{1000}$ is

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22. The number of integers in the range of 'a' for which roots of $x^2 - 2x - a^2 + 1 = 0$ lie between the roots of the equation $x^2 - 2(a+1)x + a(a-1) = 0,$ is

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23. Let u,v,w be three real numbers in geometric progression such that $u > v > w.$ Suppose $u^{40} = u^n = w^{60}.$ Then the value of $\frac{n}{6}$ is equal to

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24. If lines $\frac{x-1}{2} = \frac{y-2}{x_1} = \frac{z-3}{x_2}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ lie in the same plane, then for equation $x_1 t^2 + (x_2 + 2)t + a = 0$ sum of roots is $\alpha,$ then $|\alpha|$ is

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25. Let $f(x) = \begin{cases} x-1, & x<0 \\ x^2-2x, & x \geq 0 \end{cases}$ and $h(x) = |f(x)|$. Find the number of points at which function h is not differentiable.

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26. If $\left(\hat{i}+\hat{j}+3\hat{k}\right)x + \left(3\hat{i}-3\hat{j}+\hat{k}\right)y + \left(-4\hat{i}+5\hat{j}+0\hat{k}\right)z = \lambda\left(x\hat{i}+y\hat{j}+z\hat{k}\right)$ where $(x, y, z) \neq (0, 0, 0)$. Find how many values of λ exists.

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27. Total number of solutions of

$\log_5\left(x^2-4x+3\right) = \log_5(3x+21)$.

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28. In a group of 6 people, each person sends an email and receives an email amongst themselves. The different number of ways of doing this is N then the last digit of N is (if it is given that no one sends email back to himself)

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29. The weighted means of first 7 natural numbers whose weights are equal to the square of corresponding numbers. Find the weight mean.

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30. A point moves in the X-Y plne such that the sum of its distance form two mutally perpendicular lines is always equal to 3. The area (in square unit) enclosed by the locus of the point is

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