MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 98

Mathematics Single Choice

1. For $|x| < 1,$ the coefficient of the term independent of x in the expansion of $\frac{1}{(x-1)^2(x-2)}$ is _____

A. 2

B. 1

C. 0

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

Answer: D

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2. If latus rectum of the ellipse $x^2 \tan^2 \alpha + y^2 \sec^2 \alpha = 1$ is $\frac{1}{2}$ then

$\alpha(0 < \alpha < \pi/3)$ is equal to

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

B. $\frac{\pi}{12}$

C. $\frac{\pi}{43}$

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

Answer: B

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3. Which of the following is FALSE for any two statements p and q ?

A. $\sim[p \vee (\sim q)] = (\sim p) \wedge q$

B. $\sim(p \vee q) = (\sim p) \vee (\sim q)$

C. $q \wedge \sim q$ is a contradiction

D. $\sim(p \wedge (\sim p))$ is a tautology

Answer: B

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4. If A = $\begin{bmatrix} 1 & \log_b a \\ \log_a b & 1 \end{bmatrix}$. then $|A|$ is equal to

A. 1

B. 0

C. $\log_a b$

D. $\log_b a$

Answer: B

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5. If $f(x) = (p^2 - 1)[\tan^{-1} x] + 4(q^2 + 2q - 3)\left\{\frac{1}{2 + x^2}\right\}$ + (p+q) sgn $(x^2 - x + 2)$ is continuous in R and $f(x_1) = f(x_2) \forall x_1, x_2 \in R$, then largest value of $|p + q|$ is [Note : sgn (y),[y] and {y} denote signum function, greatest integer function and fractional part function respectively .]

A. 0

B. 2

C. 4

D. 5

Answer: C

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6. What is the decimal equivalent of binary number 10101

A. 20

B. 21

C. 22

D. 23

Answer: B

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7. If a,b,c are real numbers forming an A.P. and 2+a,3+b,2+c are in G.P., then minimum value of ac is

A. 4

B. 5

C. 6

D. 8

Answer: A

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8. A car is parked by an owner amongst 25 cars in a row not at the two extremes. On his return,he find that exactly 15 places are still

occupied. The probability that both the nelghbouring places are vacant is

A. $\frac{15}{92}$

B. $\frac{91}{276}$

C. $\frac{15}{184}$

D. None of these

Answer: A

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9. If θ is the angle between the line $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$ and the plane $2x - y + \sqrt{\lambda}z + 4 = 0$ such that $\cos\theta = \frac{1}{3}$, then λ is equal to

A. $\frac{5}{3}$

B. $\frac{5}{2}$

C. $\frac{5}{4}$

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

Answer: A

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10. Let f: $R \to R$ be a function defined by

f(x)= $-x^3 - 3x^2 - 6x + 1$. Number of integers in the solution set of x satisfying the inequality

$f(f(x^3 + f(x))) \text{ is } \geq f(f(-f(x) - x^3))$

A. 3

B. 4

C. 5

D. 6

Answer: A

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11. α and β are cube roots of unity. Then $\alpha^4 + \beta^4 + \alpha^{-1}\beta^{-1}$ is equal to

A. 1

B. 0

C. -1

D. None of these

Answer: B

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12. If f (n) denotes the n^{th} term of the sequence 3,9,19,33, ... And g(n) denotes the n^{th} term of the sequence 3,7,13,21,..... Then $\lim_{n \to \infty} \frac{f(n)}{g(n)}$ is equal to

A. 0

B. 1

C. 2

D. ∞

Answer: C

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13. If $f(x) = ae^{|x|} + b|x|^2$. where a,b $\in$ R and f (x) is derivable at x = 0. then

A. a=0,b $\in$ R

B. a=1,b=2

C. b=0,a $\in$ R

D. a=4,b=5

Answer: A

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14. $\int \frac{dx}{\cos x + \sqrt{3}\sin x}$ is equal to

A. $\log\left|\tan\left(\frac{x}{2}+\frac{\pi}{12}\right)\right| + C$

B. $\log\left|\tan\left(\frac{x}{2}-\frac{\pi}{12}\right)\right| + C$

C. $\frac{1}{2}\log\left|\tan\left(\frac{x}{2}+\frac{\pi}{12}\right)\right| + C$

D. $\frac{1}{2}\log\left|\tan\left(\frac{x}{2}-\frac{\pi}{12}\right)\right| + C$

Answer: C

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15. The locus of the centres of the circles which cut the circles $x^2 + y^2 + 4x - 6y + 9 = 0$ and $x^2 + y^2 - 5x + 4y - 2 = 0$ orthogonally is .

A. 9x+10y-7=0

B. x-y+2=0

C. 9x-10y+11=0

D. 9x+10y+7=0

Answer: C

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16. The line x=0 divides the area enclosed by the curves |x-1|-y=0.

|x|+y-3=0 into two areas R_1 and R_2 where $R_1 < R_2$ Then the ratio of R_1 and R_2 is

A. $1:2$

B. $1:4$

C. $1:\sqrt{2}+1$

D. $1:3$

Answer: D

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17. If the following numbers 13,15,11,6,4,2,18,8 are present in a data set. The median of the given set is -

A. 5.5

B. 8.5

C. 9.5

D. 11.5

Answer: C

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18. In what direction a line be drawn through the point (1,2) . So that its point of intersection

with the line x+y=4 is at a distance $\sqrt{6}/3$ from the given point ?

A. 30°

B. 45°

C. 60°

D. 75°

Answer: D

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19. If the equation in X given by $\left(2\left(\frac{1}{\cos^{-1}x}\right)^{2\pi}\right) - \left(a+\frac{1}{2}\right)\left(2\left(\frac{1}{\cos^{-1}}\right)\right)^{\pi} - a^2 = 0$ has only one real solution then exhaustive set of values of 'a' is

A. (-3,1)

B. $(-\infty, -3] \cup [1, \infty)$

C. $(-\infty, -3) \cup (1, \infty)$

D. [-3, ∞)

Answer: B

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20. For every natural number n,n $\left(n^2-1\right)$ is divisible by

A. 4

B. 6

C. 10

D. None of these

Answer: B

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Mathematics Subjective Numerical

1. If $y = \tan^{-1}\left(\frac{1}{x^2+x+1}\right) + \tan^{-1}\left(\frac{1}{x^2+3x+3}\right) + \tan^{-1}\left(\frac{1}{x^2+5x+7}\right)$. $x > 0$ and $+\tan^{-1}\left(\frac{1}{x^2+7x+13}\right)$ $\left(\frac{dy}{dx}\right)_{x=0} = \frac{-k}{1+k}$ find the value of k.

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2. Let n=27. Let the number of ways of selecting three numbers from 1,2,3,.....,n in A.P. be p^2 then find p

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3. If A is an idempotent matrix satisfying $(I - 0.4A)^{-1} = (I - \alpha A)$ (where I is the unit matrix of same order as that of A, A is not a null matrix). Than $\frac{1}{\alpha}$ is

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4. Let P(6,3) be a point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2}$ =1. If the normal at the point P

intersects the x- axis at (12,0). Find the eccentricity of the hyperbola. $\left(\sqrt{2} = 1.41\right)$

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5. If $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 4, \left|\vec{c}\right| = 5$ and every vector $\vec{\alpha}$ is perpendicular to the

sum of the other two vectors. Then the value of $\left|\vec{a} + \vec{b} + \vec{c}\right|^2$ is :

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6. 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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7. If $30\left(\tan^2 x - \cos^2 x\right) + 7\cos 2x + 20 = 0$ then evaluate $2\cos 2x - 1$

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8. Let $0 < A, B < \frac{\pi}{2}$. If $A = \tan^{-1}\left(\frac{x\sqrt{3}}{2k - x}\right)$ and $B = \tan^{-1}\left(\frac{2x - k}{k\sqrt{3}}\right)$ then evaluate A - B (in degrees)

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9. Let $y = f(x)$ and $xy(1+y)dx = dy.$ If $f(0) = 1$ and $kf(2) = (1+f(2))e^2,$

$k \in$, then k is equal to [Note : e denotes Napier's constant]

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