MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 40

Mathematics

1. In a triangle ABC, $\sum_{r=0}^{n} {}^{n}C_r a^r$ is

$b^{n-4}\cos(rB-(n-r)A)$

equal to (where a,b,c represents the sides and A,B,C represents the angles of ΔABC)

A. a^n

B. b^n

C. c^n

D. None of these

Answer: C

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2. Let $|z+i| = -z+i = 0$, then argumentof z can't be

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

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

C. $-\frac{\pi}{6}$

D. $-\frac{3\pi}{4}$

Answer: D

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3. If AB=0, then for the matrices

$$A = \left[\left(\cos^2\theta, \cos\theta\sin\theta\right) < \left(\cos\theta\sin\theta, \sin^2\theta\right)\right]$$

and

$$B = \begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix}, \theta - \phi \text{ is}$$

A. an odd number of $\frac{\pi}{2}$

B. an odd multiple of π

C. an even multiple of $\frac{\pi}{2}$

D. 0

Answer: A

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4. If a matrix $A = \begin{bmatrix} 2 & 4 & 5 \\ 4 & 8 & 10 \\ -6 & -12 & -15 \end{bmatrix}$ then the rank of A is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B

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5. There are two bags, bag 1 contains 3 white and 2 redballs and bag 2 contains 4 white and 5 red balls. A ball is drawn randomly from bag 1 and put and in bag 2.Now 2 balls are drawn from bag 2 and found to be red. Then the probability that white ball was drawn from bag 1 to bag 2 is

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

B. $< \frac{1}{4}$

C. $> \frac{3}{4}$

D. $> \frac{1}{4}$

Answer: D

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6. If all the equations

$x^2 + (2a + 3b)x + 60 = 0, x^2 + ax + 10 = 0$

and $x^2 + bx + 8 = 0$ where $a, b \in R$ have a common root, then the value of $|a - b|$ is

A. 0

B. 1

C. 2

D. None of these

Answer: B

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7. If R is a relation on the set N, defined by $\{(x, y) : 2x - y = 10\}$ then R is

A. reflexive

B. symmetric

C. transitive

D. None of these

Answer: D

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8. The locus of the centre of a variable circle touching two circles of radius r_1 and r_2 externaly which also touch each

other externally is a conic. The eccentricity of the conic if $\frac{r_1}{r_2} = 3 + 2\sqrt{2}$ is

A. 1

B. $\sqrt{2}$

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

D. $2\sqrt{2}$

Answer: B

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9. If the line joining the foci of the hyperbola $S_1 = \frac{x^2}{a^2} - \frac{y^2}{b^2} + 1 = 0$ does not subtend a right angle at any point on the hyperbola $S_2 \equiv \frac{x^2}{4a^2} - \frac{y^2}{b^2} = 1$ then

number of integral values of $4e^2$ is /are (e is eccentricity of $S_2 = 0$)

A. 1

B. 2

C. 3

D. 4

Answer: B

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10. The equation of circle touching the parabola $y = 1 - x^2$ at the point (2,-3) and having its centre on the line $y + x = 0$ is

A. $(x-3)^2+(y+3)^2=1$

B. $\left(x-\frac{14}{5}\right)^2+\left(y+\frac{14}{5}\right)^2=\frac{17}{25}$

C. $\left(x+\frac{14}{25}\right)^2+\left(y-\frac{14}{25}\right)^2=\frac{17}{25}$

D. $(x-4)^2+(y+4)^2=5$

Answer: B

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11. In ΔABC if medians from B and C are mutually perpendicular then the possible value of $\cot B+\cot C$ is

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

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

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

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

Answer: D

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12. Let P be the point (1,2,3) and Q be a point on the line

$\vec{r} = \left(\hat{i} - \hat{j} + 5\hat{k}\right) + \lambda\left(-2\hat{i} + 3\hat{j} + 4\hat{k}\right).$

Then the value of λ for which line PQ is perpendicular to the plane $4x + 9y - 18z = 1$ is

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

B. $-\frac{1}{6}$

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

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

Answer: D

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13. The equation of line through (1,2,-1) and perpendicular to the lines

$\vec{r} = \left(\hat{i} + \hat{j}\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$ and

$\vec{r} = \left(-\hat{i} + 2\hat{j}\right) + \mu\left(\hat{j} - 3\hat{k}\right)$ is

A. $\vec{r} = \left(\hat{i} + 2\hat{j} - k\right) + \lambda\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

B. $\vec{r} = \left(\hat{i} + 2\hat{j} - k\right) + \lambda\left(\hat{i} - \hat{j} + \hat{k}\right)$

C. $\vec{r} = \left(\hat{i} + 2\hat{j} - k\right) + \lambda\left(\hat{j} - 3\hat{k}\right)$

D. None of these

Answer: A

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14. If $\lim_{x \to 0} \left(\frac{a \sin x + b \tan x}{x^3} \right) = \frac{3}{2}$ then $|a + 2b|$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: D

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15. If $f(x) = |x - 2|$ and $g(x) = f(f(x))$ then for $x > 10, g'(x)$ equal

A. -1

B. 0

C. 1

D. $2x - 4$

Answer: C

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16. $\int_0^1 \left[\sin^{-1}\left(\frac{2x}{1+x^2}\right) + \left[\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + \left[\tan^{-1}\left(\frac{2x}{1-x^2}\right)\right]\right]\right] dx$ equal to

(where [.] is G.I.F)

A. 1

B. 2

C. 0

D. $3\left(1-\tan\frac{1}{2}\right)$

Answer: D

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17. If the substitution $x=\tan^{-1}(t)$ transforms the differential equation $\frac{d^2y}{dx^2}+xy(dy)?(dx)+\sec^2 x=0$ into a differential equation

$(1+t^2)\frac{d^2y}{dt^2}+(2t+y\tan^{-1}(t))\frac{dy}{dt}=k$, then k is equal to

A. -2

B. 2

C. 1

D. 0

Answer: C

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18. If $\int\sqrt{1+\sec x}dx=2(fog)(x)+C$ then

A. $f(x)=\sec x-1$

B. $f(x) = 2\tan^{-1} x$

C. $g(x) = \sqrt{\sec x - 1}$

D. None

Answer: C

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19. Number of ways of seat 8 men and 8 women around a round table where one particular man and one particular woman always sit together, and men and women alternate is equal to

A. $2 \times (7!)^2$

B. $2(6!)^2$

C. $16! - 2! \times 14!$

D. None of these

Answer: A

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20. The value of x in $\left(0, \frac{\pi}{2}\right)$ satisfying equation $\frac{\sqrt{5}-1}{\sin x} + \frac{\sqrt{10+2\sqrt{5}}}{\cos x} = 8$ is

A. $\frac{\pi}{8}$

B. $\frac{\pi}{9}$

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

D. None of these

Answer: C

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21. If x_1 and $x_2(x_1 < x_2)$ are two valus of x satisfying the equation $\left|2\left(x^2+\frac{1}{x^2}\right)+\left|\left|1-x^2\right|\right|,$ then the value of $=4\left(\frac{3}{2}-2^{x^2-3}-\frac{1}{2^{x^2+1}}\right)$ $\int_{x_1+x_2}^{3x_2-x_1}\left\{\frac{x}{4}\right\}\left(1+\left[\tan\left(\frac{\{x\}}{1+\{x\}}\right)\right]\right)dx$(where [.] and [.] denote greatest integer function and fractional part function respectively)

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22. Let $f(x) = \begin{cases} 2 - x + a^2 - 9a - 9 & x < 2 \\ 2x - 3 & x \geq 2 \end{cases}$

where a is a positive constant. If f(x) has local minimum at x=2, then the least integral value of a is

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23. Suppose $y = f(x)$ be a real valued differentiable function on Rsuch that $f(1) = 1$. If $f(x)$ satisfies $xf'(x) = x^2 + f(x) - 2$ then what will be the ara bounded by f(x)with x-axis between ordinates x=0 and x=3.

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24. Let $f(x)$ be a function defined for $x \in R$ such that

$f^3(x) - 6f^2(x) + 11f(x) - 6 = 0 \forall x$. If $\in R$

is given that f(x) is discontinuous at x=0 only then number

of such possible functions f(x) is

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25. If $|x| < 1$, then find the value of

$$\frac{1-2x}{1-x+x^2} + \frac{2x-4x^3}{1-x^2+x^4} + \frac{4x^3-8x^7}{1-x^4+x^8} + \ldots\ldots\ldots\ldots \infty$$

when $x = \frac{1}{2}$

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26. If $\sin A + \cos A = m$ and $\sin^3 A + \cos^3 A = n$ then the value of $m^3 - 3m + 2n$ is

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27. The mean of the data set comprising of 15 observations is 15. If one of the observation valued 2 is deleted and three new observations valued 4,5 and 6 are added to the data, then find the mean of the resultant data.

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28. $B = (2, 0), C = (8, 0)$ are the vertices of a triangle ABC such that $4\tan\frac{B}{2}\tan\frac{C}{2} = 1$. If the locusof point A is

an ellipse, then the difference between the semi major axis and the semi minor axis is

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29. An observer on the top of a tree, finds the angle of depression of a car moving towards the tree to be 30°. After 3 minutes this angle becomes 60°. After how much more time, the car will reach the tree (in min.)

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30. In n be the number of distinct solutions of the equation $\cos^{-1}|x| + \cos^{-1}|2x| = \pi$, then the value of $\frac{1}{n}$ is equal to

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