MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 49

Mathematics

1. Let $\left(1+x+x^2\right)^3(1+2x)=a_0+a_1x+a_2x^2+ \ldots\ldots\ldots +a_7x^7$ then $\sum_{k=0}^{7}\frac{a_k}{k+1}$ is equal to:

A. 16

B. 20

C. 24

D. 28

Answer: B

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2. The vertices of a triangle are $3+4i, 4+3i$ and $2\sqrt{6}+i$, then distance between ortho-centre and circum-centre of the triangle is equal to:

A. $\sqrt{137-28\sqrt{6}}$

B. $\sqrt{137+28\sqrt{6}}$

C. $\frac{1}{2}\sqrt{137+28\sqrt{6}}$

D. $\frac{1}{3}\sqrt{137+28\sqrt{6}}$

Answer: B

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3. Let A & B be 3×3 symmetric matrices such that X = AB + BA and Y = AB - BA. Then $(XY)^T$ is equal to $(XY)^T$ is the transpose of matrix XY.]

A. XY

B. YX

C. $-XY$

D. $-YX$

Answer: D

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4. The number of polynomials of the form $x^3 + ax^2 + bx + c$ which are divisible $x^2 + 1$ where $a, bc \in \{1, 2, 3, ..., 10\}$ is equal to

A. 10

B. 20

C. 30

D. 40

Answer: A

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5. If $\alpha_1, \alpha_2, \alpha_3, \dots\dots\dots, \alpha_n$ an are n real roots of equation f(x) = 0 and f(x) satisfies the condition $f(k - x) = f(x + k)$ then the value of $\sum_{i=1}^{n}$ is equal to:

A. $2nk, \forall n \in N$

B. $nk, \forall n \in N$

C. nk, if n is odd

D. nk, if n is even

Answer: B

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6. If S denotes the sum of first 24 terms of series:

$\frac{1^2}{1.3}+\frac{2^2}{3.5}+\frac{3^2}{5.7}+$ .... Then S =

A. $\frac{300}{49}$

B. $\frac{300}{51}$

C. $\frac{295}{49}$

D. None

Answer: A

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7. In a certain town 25% families own a phone and 15% own a car, 65% families own neither a phone nor a car. 2000 families own both a car and a phone. Consider the following statement in this regard.

1. 10% families own both a car and a phone

2. 35% families own either a car or a phone

3. 40000 families live in the town

Which statement(s) is / are correct ?

A. 1 and 2

B. 1 and 3

C. 2 and 3

D. 1,2 and 3

Answer: C

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8. A variable circle passes through the fixed point A(p, q) and touches x-axis. The locus of the other end of the diameter through A is:

A. $(y-q)^2=4px$

B. $(x-q)^2=4py$

C. $(y-p)^2=4qx$

D. $(x-p)^2=4qy$

Answer: D

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9. A hyperbola having foci A(4, - 1) and B(4, 5) has $x+y-7=0$ as one of its tangent, then the point of contact of this tangent is:

A. $\left(\frac{9}{5}, \frac{5}{2}\right)$

B. $(1, 6)$

C. (0,7)

D. (2,5)

Answer: C

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10. The locus of the middle points of the normal chords of the parabola, $y^2 = 4ax$ is

A. $x + 2a = \frac{y^2}{2a} + \frac{4a^3}{y^2}$

B. $x + 2a = \frac{y^2}{2a} - \frac{4a^3}{y^2}$

C. $x - 2a = \frac{y^2}{2a} + \frac{4a^3}{y^2}$

D. None of these

Answer: C

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11. The angle between the tangents to the curve $y = x^2 - bx + 6$ at points (2, 0) and (3, 0) is:

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

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

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

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

Answer: D

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12. The equation of the plane through the line of intersection of planes:

ax + by + cz + d = 0, ax + b'y + c z + d' = 0 and parallel to the line y = 0, z = 0 is:

A. (ab'-a'b)x + (bc'-b'c)y +(ad'-a'd)=0

B. (ab'-a'b)x + (bc' -b'c)y + (ad'- a'd)z=0

C. (ab'-a'b)y + (ac' - a'c)z + (ad'-a'd)=0

D. None of these

Answer: C

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13. If D, E and F are the mid points of the sides BC, CA, AB respectively of a triangle ABC:

$\overrightarrow{AD}+\frac{2}{3}\overrightarrow{BE}+\frac{1}{3}\overrightarrow{CF}=K\overrightarrow{AC}$, then 2K is equal to:

A. 1

B. 3

C. 2

D. 5

Answer: A

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14. If $y = A\sin\omega t$ then $\frac{d^5y}{dt^5}$ =

A. $A\omega^5\cos\left(\omega t - \frac{\pi}{2}\right)$

B. $A\omega^5\sin\left(\omega t - \frac{\pi}{2}\right)$

C. $A\omega^5\cos\left(\omega t + \frac{\pi}{2}\right)$

D. $A\omega^5\sin\left(\omega t + \frac{\pi}{2}\right)$

Answer: D

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15. If the number of points of discontinuity and number of points of non differentiability of $f(x) = \min\{\sin x, \sin^{-1}(\cos x)\}$ are p and q respectively, then ordered pair (p, q) is:

A. (1,2)

B. (1,3)

C. (0,2)

D. (0,3)

Answer: D

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16. General solution of differential equation:

$(e^y + 1)\cos x dx + e^y \sin x dy = 0$ is:

A. $(e^y + 1)\cos x = \lambda$

B. $(e^y - 1)\sin x = \lambda$

C. $(e^y + 1)\sin x = \lambda$

D. none

Answer: C

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17. $\int \frac{dx}{(x+1)^{\frac{6}{5}}(x-3)^{\frac{4}{5}}}$ is equal to:

A. $\frac{5}{4}\left(\frac{x-3}{x+1}\right)^{1/5} + C$

B. $\frac{4}{5}\left(\frac{x-3}{x+1}\right)^{1/5} + C$

C. $\frac{5}{4}\left(\frac{x+1}{x-3}\right)^{1/5} + C$

D. $\frac{4}{5}\left(\frac{x+1}{x-3}\right)^{1/5} + C$

Answer: A

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18. If $f(x) = \sin^4 x + \cos^4 x - \frac{1}{2}\sin 2x$, then the range of f(x) is:

A. $\left[0, \frac{3}{2}\right]$

B. $\left[-\frac{1}{2}, \frac{7}{2}\right]$

C. $\left[0, \frac{9}{8}\right]$

D. $\left[\frac{3}{4}, \frac{7}{8}\right]$

Answer: C

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19. If a pair of variable straight lines $x^2 + Ay^2 + axy = 0$ (where a is a real parameter) cut the ellipse $x^2 + Ay^2 = 4$ at two points, then locus of the point of intersection of tangents at A and B is:

A. $4x^2 - y^2 = 0$

B. $x^2 - 4y^2 = 0$

C. $x^2 + 4y^2 - 16 = 0$

D. $x^2 - 4y^2 - 32 = 0$

Answer: B

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20. The value of θ so that $\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$, $\cos^{-1}\left(\frac{1}{\sqrt{10}}\right)$ and $\sin^{-1}\theta$ are tne angle of a triangle is:

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

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

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

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

Answer: C

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21. If the system of equations are:

$2x - y + 2z = 2, x - 2y - z = -4$ & $x + y + \lambda z = 4,$ then the value of A such that the given system of equation has no solution, is:

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22. Let QP and NM be vertical walls. NM = 16 m. and $QN = \frac{27}{4}$ m. Then the least length of a ladder which reaches the tops P and N of the walls.

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23. Consider the triangle PQR, let a, b and c be the lengths of the sides opposite to the angles P,Q and R respectively, and

$\frac{a^2 - b^2}{2bc} = \cos P$ and $\lambda = \frac{\sin R}{\sin(P - Q)}$. If distance between two parallel lines $2x + \lambda y - 2 = 0$ and $\lambda x + y + 3 = 0$ is given to be d, then the value of d^2 equals:

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24. The value of $\int_0^1 4x^3 . \left(\frac{d^2}{dx^2}\left(1 - x^2\right)^5\right)dx$ is:

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25. If sum of the solutions of the trigonometric equation $3\cot^2 x + \cot x = -3$ in $[0, 2\pi]$ is $k\pi$ then the value of k is:

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26. From each of the three boxes containing 3 white and 1 black, 2 white and 2 black, 1 white and 3 black balls, one ball is drawn at random. If $\frac{p}{q}$ represents the probability that 2 white and 1 black balls are drawn then evaluate $3p - q$. [Given that G.C.D. (p,q) =1]

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27. Let $f:(-1,1) \to R$ be a differentiable function with $f(0) = -1$ and $f'(0) = 1$. If $g(x) = [f\{2f(x) + 2\}]^2$, then find find $|g'(0)|$

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28. An equilateral triangle has vertices as the points $A\left(\frac{2}{\sqrt{3}}\right)e^{i\frac{\pi}{2}}, B\left(\frac{2}{\sqrt{3}}\right)e^{-I\frac{\pi}{6}}, C\left(\frac{2}{\sqrt{3}}\right)e^{-I\frac{5\pi}{6}}$. If P be any point on its incircle, then $\left(AP^2 + BP^2 + CP^2\right)$= (where $i = \sqrt{-1}$)

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29. If $\int (4x+1)\sqrt{x^2-x-2}dx = \frac{4}{3}f(x^2-x-2)$, then $+\frac{p}{q}(2x-1)g(x^2-x-2) - \left(\frac{m}{n}\right)h\left(\left|x-\frac{1}{2}+\sqrt{x^2-x-2}\right|\right)+c$

evaluate $\left[\frac{m}{n}\right]+f(4)+pq+g(4)+h(1)$, where [ ] represents the greatest integer function, and G.C.D. $(p, q)=1$, G.C.D. (m,n) =1

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30. A cube in the first octant has sides OP, OQ and OR of length 1, along the z-axis, y-axis and z-axis, respectively, where O(0, 0, 0) is the origin. Let the centre of the cube be at $S\left(\frac{1}{2}. \frac{1}{2}, \frac{1}{2}\right)$ and T be the vertex of the cube opposite to the origin O such that S lies on the diagonal OT. If $\vec{p} = \overrightarrow{SP}$, $\vec{q} = \overrightarrow{SQ}$, $\vec{r} = \overrightarrow{SR}$ and $\vec{t} = \overrightarrow{ST}$, then the value of $\left|\left(\vec{p}\times\vec{q}\right)\times\left(\vec{r}\times\vec{t}\right)\right|$ is:

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