MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 91

Mathematics

1. If x, y and z are the roots of the equation $2t^3 - (\tan[x+y+z]\pi)t^2 - 11t + 2020 = 0$, then $\begin{vmatrix} x & y & z \\ y & z & x \\ z & x & y \end{vmatrix}$ is equal to (where, $[x]$ denotes the greatest integral value less than or equal to x)

A. 20

B. -10

C. 0

D. 1

Answer: C

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2. Let $f(x) = \min\left\{\sqrt{4-x^2}, \sqrt{1+x^2}\right\} \forall, x \in [-2, 2]$ then the number of points where $f(x)$ is non - differentiable is

A. 1

B. 0

C. 4

D. 2

Answer: C

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3. The probability of a problem being solved by 3 students independently are $\frac{1}{2}, \frac{1}{3}$ and α respectively. If the probability that the problem is solved

in P(S), then P(S) lies in the interval (where, $\alpha \in (0, 1)$)

A. $\left(0, \frac{1}{2}\right)$

B. $\left(\frac{1}{3}, \frac{1}{2}\right)$

C. $\left(\frac{2}{3}, 1\right)$

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

Answer: C

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4. Consider a matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 0 & -3 & 0 \\ 1 & 1 & 1 \end{bmatrix}$. If $6A^{-1} = aA^2 + bA + cI$, where $a, b, c \in$ and I is an identity matrix, then $a + 2b + 3c$ is equal to

A. 10

B. -10

C. 8

D. 0

Answer: B

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5. If the value of the sum $29\left(.^{30}C_0\right)+28\left(.^{30}C_1\right)+27\left(.^{30}C_2\right)+\ldots\ldots+1\left(.^{30}C_{28}\right)+0.\left(.^{30}C_{29}\right)$ is equal to $K.2^{32}$, then the value of K is equal to

A. 7

B. 14

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

D. $\frac{7}{2}$

Answer: D

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6. The value of the integral $I=\int_{\frac{1}{\sqrt{3}}}^{\sqrt{3}}\frac{dx}{1+x^2+x^3+x^5}$ is equal to

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

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

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

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

Answer: C

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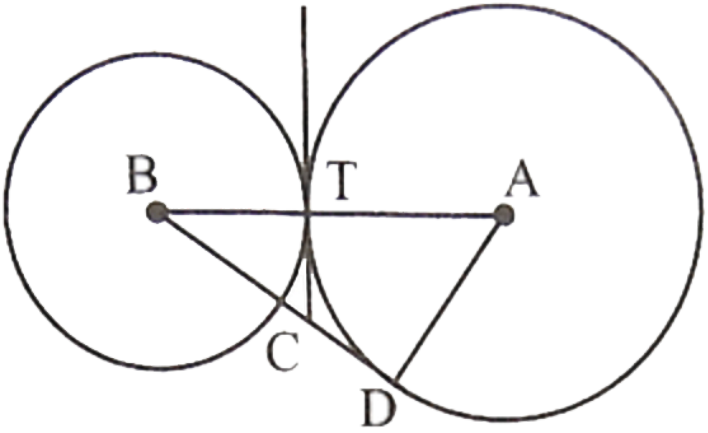
7. Two circles with centres at A and B touch each other externally at T. Let BD is the tangent at D and TC is a common tangent. If AT has length 3 units and BT has length 2 units, then the length (in units) of CB is



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

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

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

D. $\frac{7}{4}$

Answer: B

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8. Let $a_n = 16, 4, 1, \ldots\ldots\ldots$ be a geometric sequence. The value of $\Sigma_{n=1}^{\infty} \sqrt[n]{P_n}$, where P_n is the product of the first n terms, is equal to.

A. 8

B. 16

C. 32

D. 64

Answer: C

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9. A curve in the first quadrant is such that the slope of OP is twice the slope of the tangent drawn at P to the curve, where O is the origin and P is any general point on the curve. If the curve passes through (4, 2), then its equation is

A. $y = x^2 - 14$

B. $y^2 = x$

C. $y = x^3 - 62$

D. $y = \sin(x - 4) + 2$

Answer: B

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10. There are six periods in each working day of the school. In how many ways can one arrange 5 subjects such that each subject is allowed at least

one period?

A. 210

B. 1800

C. 360

D. 120

Answer: B

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11. If the maximum area bounded by $y^2 = 4x$ and the line $y = mx(\forall m \in [1, 3])$ is k square units, then the smallest prime number greater than 3k is

A. 3

B. 5

C. 7

D. 11

Answer: D

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12. The indefinite integral $\int e^{e^x}\left(\frac{xe^x.\ln x+1}{x}\right)dx$ simplifies to (where, c is the constant of integration)

A. $x\ln(\ln x)+c$

B. $e^{e^x}+c$

C. $\frac{e^{e^x}}{x}+c$

D. $e^{e^x}.\ln x+c$

Answer: D

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13. The line through the points $(m, -9)$ and $(7, m)$ has slope m. Then, the x - intercept of this line is

A. -18

B. -6

C. 6

D. 18

Answer: C

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14. All the values of m for which both roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4, lie in the interval

A. 0

B. 1

C. 2

D. more than 2

Answer: D

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15. The locus of the midpoint of the chords of the hyperbola $\frac{x^2}{25} - \frac{y^2}{36} = 1$ which passes through the point (2, 4) is a hyperbola, whose transverse axis length (in units) is equal to

A. $\frac{16}{5}$

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

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

D. $\frac{61}{25}$

Answer: A

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16. The real part of the complex number z satisfying $|z-1-2i| \leq 1$ and having the least positive argument, is

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

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

C. $\frac{6}{5}$

D. $\frac{7}{5}$

Answer: B

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17. The mean and variance of 10 observations are found to be 10 and 5 respectively. On rechecking it is found that an observation 5 is incorrect. If the incorrect observation is replaced by 15, then the correct variance is

A. 7

B. 8

C. 9

D. 4

Answer: D

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18. The value of $\lim_{x \to \pi} \frac{\tan(\pi \cos^2 x)}{\sin^2(2x)}$ is equal to

A. 1

B. π

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

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

Answer: C

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19. If $f(x) = \dfrac{x^2 - [x^2]}{x^2 - [x^2 - 2]}$ (where, $[.]$ represents the greatest integer part of x), then the range of f(x) is

A. $[0, 1)$

B. $(-1, 1)$

C. $(0, \infty)$

D. $\left[0, \dfrac{1}{3}\right)$

Answer: D

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20. If the angle between the plane $x - 3y + 2z = 1$ and the line $\dfrac{x-1}{2} = \dfrac{y-1}{-1} = \dfrac{z-1}{-3}$ is θ, then $\sec 2\theta$ is equal to

A. $\dfrac{107}{11}$

B. $\dfrac{49}{48}$

C. $\dfrac{100}{9}$

D. $\frac{87}{79}$

Answer: B

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21. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors such that $3\vec{a} + 4\vec{b} + 6\vec{c} = \vec{0}, \left|\vec{a}\right| = 3, \left|\vec{b}\right| = 3$ and $\left|\vec{c}\right| = 4$, then the value of $-864\left(\frac{\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}}{6}\right)$ is equal to

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22. If the number of principal solutions of the equation $\tan(7\pi\cos x) = \cot(7\pi\sin x)$ is k, then $\frac{k}{5}$ is equal to

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23. The numberof real values of x that satisfies the equation $x^4 + 4x^3 + 12x^2 + 7x - 3 = 0$ is

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24. If the normals of the parabola $y^2 = 4x$ drawn at the end points of its latus rectum are tangents to the circle $(x-3)^2 + (y+2)^2 = r^2$, then the value of r^4 is equal to

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25. A man is walking towards a vertical pillar in a straight path at a uniform speed. At a certain point A on the path, he observes that the angle of elevationof the top of the pillar is 30°. After walking for $5\left(\sqrt{3}+1\right)$ minutes from A in the same direction, at a point B, he observes that the angle of elevation of the top of the pillar is 45°. Then the time taken (in minutes) by him, to reach from B to the pillar, is (take $\sqrt{3} = 1.73$)

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