MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 59

Mathematics

1. The tangents at z_1, z_2 on the circle $|z - z_0| = a$, meet at z_3. Then $\left(\frac{z_3 - z_1}{z_0 - z_1}\right)\left(\frac{z_0 - z_2}{z_3 - z_2}\right)$ is equal to

A. 0

B. 1

C. -1

D. 2

Answer: C

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2. Let $A = \begin{bmatrix} x^2 & 6 & 9 \\ 3 & y^2 & 9 \\ 4 & 5 & z^2 \end{bmatrix}$, B if $= \begin{bmatrix} 2x & 3 & 5 \\ 2 & 2y & 6 \\ 1 & 4 & 2z-3 \end{bmatrix}$

trace A=trace B, then x+y+z is equal to

A. 1

B. 2

C. 3

D. None of these

Answer: C

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3. If for an $A.P.\ a_1, a_2, a_3, \ldots\ldots\ldots\ldots, a_n,$ $a_1 + a_3 + a_5 = -12$ and $a_1 a_2 a_3 = 8,$ then $a_2 + a_4 + a_6$ is

A. -12

B. -16

C. 18

D. -21

Answer: D

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4. Consider a chord to the hyperbola $xy = 9$ which has x-intercept 3 and y-intercept 15. The midpoint of this chord is

A. $\left(\frac{15}{2}, \frac{3}{2}\right)$

B. $\left(\frac{3}{2}, \frac{15}{2}\right)$

C. $(9, 12)$

D. $(12, 9)$

Answer: B

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5. Normals having slope $m_1, m_2, m_3, (m_1 < 0)$ are drawn at points $P(a, b), Q, R$ respectively on the curve $y^2 - 6y - 16x + 73 = 0$ so as to intersect at point S(19,6) then a+b is equal to

A. 24

B. 28

C. 32

D. 36

Answer: B

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6. PA is tangent to $x^2 + y^2 = a^2$ and PB is tangent to $x^2 + y^2 = b^2 (b > a)$. If $\angle APB = \frac{\pi}{2}$, then locus of point P is

A. $x^2 - y^2 = a^2 - b^2$

B. $x^2 + y^2 = b^2 - a^2$

C. $x^2 + y^2 = a^2 + b^2$

D. $x^2 - y^2 = b^2 - a^2$

Answer: C

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7. The angle between tangents to the hyperbolas $xy = -16$ and $x^2 - y^2 = 6$ at their point of intersection (in IVth quadrant) is

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

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

C. $\tan^{-1}\left(\frac{8}{3}\right)$

D. $\frac{5\pi}{12}$

Answer: A

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8. A plane P is perpendicular to the vector $\vec{A} = 2\hat{i} + 3\hat{j} + 6\hat{k}$ and contains the terminal point of the vector $\vec{B} = \hat{i} + 5\hat{j} + 3\hat{k}$. The perpendicular distance from the origin to the plane P is equal to

A. 2 units

B. 5 units

C. 6 units

D. 7 units

Answer: B

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9. Let $y = f(x)$ and $= g(x)$ be two differentiable function in [0,2] such that $f(0) = 3,\ f(2) = 5,\ g(0) = 1$ and $g(2) = 2$. If there exist at least one $c \in (0, 2)$ such that $f'(c) = kg'(c)$ then k must be

A. 2

B. 3

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

D. 1

Answer: A

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10. $f'(x) = f(x) + \int_0^1 f(x)dx$ and $f(0) = 1$,

then f f(x)dx is equal to

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

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

C. $\frac{2}{2-e}e^x + \left(\frac{e}{e-2}\right)x + c$

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

Answer: B

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11. Area enclosed between the curves given by $y = x^4$ and $y = x^2 + 12$ will be (in sq.units)

A. $\frac{304}{15}$

B. $\frac{594}{15}$

C. $\frac{608}{15}$

D. cannot be determined

Answer: C

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12. If $xdy - ydx = \sqrt{x^2 - y^2}dx$ is the differential equation of the equation $y = f(x)$. If $f(1) = 0$ then $\mathrm{f}\left(\frac{e^{\pi}}{2}\right)$ is

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

B. 1

C. $e^{\frac{\pi}{2}}$

D. 0

Answer: C

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13. If $\int x^3 \sin 3x(3x\cos 3x + 2\sin 3x)dx$ then

$$= \frac{x^n (\sin 3x)^b}{d} + c,$$

$a + b + d$ is

A. 4

B. 6

C. 8

D. None of these

Answer: C

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14. The contrapositive of $(p \vee q) \Rightarrow r$ is

A. $r \Rightarrow (p \vee q)$

B. ~$r \Rightarrow (p \vee q)$

C. ~$r \Rightarrow$ ~$p \wedge$ ~q

D. $\pi mplies(q \vee r)$

Answer: C

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15. The mean and standard deviation of 6 observation are 8 and 4 respectively. If each observation is multiplied by 3, find the new standard deviation of the resulting observations

A. 12

B. 18

C. 24

D. 144

Answer: A

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16. Given that $\left(1+\sqrt{(1+x)}\tan y = 1+\left(\sqrt{1+x}\right)\right.$, then sin 4y is equal to

A. 4x

B. 2x

C. x

D. None of these

Answer: C

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17. The value of

$$\sin\frac{\pi}{14}\sin\frac{3\pi}{14}\sin\frac{5\pi}{14}\sin\frac{9\pi}{14}\sin\frac{11\pi}{14}\sin\frac{13\pi}{14}$$ is

A. $\frac{1}{16}$

B. $\frac{1}{64}$

C. $\frac{1}{128}$

D. None of these

Answer: B

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18. Value of x satisfying $\log_{\left(\frac{1}{2}\right)} \tan^{-1} x \geq -1$ is equal to

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $(-\infty, \infty)$

D. no value of x

Answer: A

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19. The valueof $\lim_{x \to 2} \frac{\cos^x \theta + \sin^x \theta - 1}{2}$ is equal to

A. $\cos^2 \theta In \cos \theta - \sin^2 \theta In \sin \theta$

B. $\cos^2 \theta In \cos \theta + \sin^2 \theta In \sin \theta$

C. $\cos^2 \theta In \sin \theta + \sin^2 In \cos \theta$

D. $\cos^2 \theta In \sin \theta - \sin^2 \theta In \cos \theta$

Answer: B

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20. A tower PQ subtends an angle α at a point A on the same level as the foot Q of the tower. It also subtends the same angle α at a point B where AB subtends the angle α with AP, then

A. AB=BQ

B. $BQ = 2AQ$

C. $\frac{AB}{BQ} = \frac{1}{2}\sin\alpha$

D. $\frac{AB}{BQ} = \frac{1}{2}\cos ec\alpha$

Answer: D

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21. If a,b,c be last three digits of the number $(6!+1)^{6!}$, then the value of $a+b+c$ is

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22. If $a \neq p, b \neq q, c \neq r$ and the system of equations

$px + by + cz = 0$

$ax + qy + cz = 0$

$ax + by + rz = 0$

has non zero solution. Then value of

$$\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} \text{ is}$$

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23. A box contains 12 mangoes out of which 5 are rotten and ret are good. Two mangoes are randomly taken out together. If it is known that atleast one of them is good, then the probability that both are good is (p/q) where p, q are prime number. The value of $|p-q|$ is

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24. Let p be an integer for which both roots of the given quadratic equation:

$x^2 + 2(p - 3)x + 9 = 0$ lies in the open interval $(-6, 1)$. If $2, g_1, g_2 \ldots\ldots . g_{19}, g_{20}, p$, are the terms of G.P then the value o $\frac{(g_4 . g_{17})}{2}$ is

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25. A chord is drawn passing through $P(2, 2)$ on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ such that it intersects the ellipse at A and B, then the maximum value of PA.PB is

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26. If one common tangent of the two circle $x^2 + y^2 = 4$ and $x^2 + (y - 3)^2 = \lambda, \lambda > 0$ passes through the point $(\sqrt{3}, 1)$, then possible value of λ is

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27. Three vectors $\overrightarrow{\alpha}, \overrightarrow{\beta}, \overrightarrow{\gamma}$ having magnitude 2,3 and $5^{\frac{1}{3}}$, respectively satisfying $\overrightarrow{\gamma} \times \left(\left(\overrightarrow{\alpha} \times \overrightarrow{\gamma}\right) \times \overrightarrow{\gamma}\right) = \overrightarrow{\beta}$. If (where p and q are co-prime), then $(q - p)$ is

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28. The value of

$$\lim_{n \to \infty} \frac{1}{n} \sum_{k=1}^{n} \left[e^{(1+k/n)^2} - \frac{3e^{\left(1+\frac{3k}{n}\right)}}{2\sqrt{1+\frac{3k}{n}}} \right]$$

equals

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29. If [.] represents the greatest integer function where $f(x) = \cos[\pi]^2 x + \cos\left[-\pi^2\right]x$, then find the value of

$$f\left(\frac{\pi}{2}\right) + f(\pi) + \frac{1}{f(-\pi)} + \sqrt{2}f\left(\frac{\pi}{4}\right)$$

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30. The greatest value of positive integer which divides

$(k+1)(k+2)(k+3)(k+4)(k+5)$ for all $k \in N$ is

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