MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 59

Mathematics

1. Consider the matrix $A = \begin{bmatrix} 3 & 1 \\ -6 & -2 \end{bmatrix}$, then $(I + A)^{40}$ is equal to

A. $I + 2^{38}A$

B. $I + 2^{39}A$

C. $I + \left(2^{40} + 1\right) A$

D. $I + \left(2^{40} - 1\right) A$

Answer: D

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2. The lines joining the origin to the points of intersection of the line $4x + 3y = 24$ with the circle $(x - 3)^2 + (y - 4)^2 = 25$ are

A. coincident

B. perpendicular

C. equally inclined to x - axis

D. None of these

Answer: B

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3. The value of the integral $I = \int_0^{\frac{\pi}{2}} \frac{\cos x - \sin x}{10 - x^2 + \frac{\pi x}{2}} dx$ is equal to

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

B. π

C. 0

D. 4π

Answer: C

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4. If $\sin x + \cos x = \frac{\sqrt{7}}{2}$, where $x \in \left[0, \frac{\pi}{4}\right]$, then the value of $\tan. \frac{x}{2}$ is equal to

A. $\frac{3-\sqrt{7}}{3}$

B. $\frac{\sqrt{7}-2}{3}$

C. $\frac{4-\sqrt{7}}{4}$

D. $\frac{5-\sqrt{3}}{2}$

Answer: B

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5. The equation $\tan^4 x - 2\sec^2 x + a^2 = 0$ will have at least one solution, if

A. $|a| \leq 4$

B. $|a| \leq 2$

C. $|a| \leq \sqrt{3}$

D. $|a| > 2$

Answer: C

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6. The statement $\sim p \rightarrow (q \rightarrow p)$ is equivalent to

A. $p \rightarrow (p \rightarrow q)$

B. $p \rightarrow (p \vee q)$

C. $q \rightarrow p$

D. $q \rightarrow (p \rightarrow q)$

Answer: C

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7. If the standard deviation of n observation $x_1, x_2, \ldots\ldots, x_n$ is 5 and for another set of n

observation $y_1, y_2, \ldots\ldots\ldots, y_n$ is 4, then the standard deviation of n observation

$x_1 - y_1, x_2 - y_2, \ldots\ldots\ldots\ldots, x_n - y_n$ is

A. 1

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

C. 5

D. Data insufficient

Answer: D

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8. The domain of the function $f(x) = \log_2\left[1 - \log_{12}\left(x^2 - 5x + 16\right)\right]$ is

A. $(1, 4)$

B. $(-\infty, 4]$

C. $[1, \infty)$

D. $[1, 4]$

Answer: A

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9. The lenth of the portion of the common tangent to $x^2 + y^2 = 16$ and $9x^2 + 25y^2 = 225$ between the two points of contact is

A. $\frac{9}{4}$ units

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

C. $\frac{3}{4}\sqrt{7}$ units

D. $\frac{5}{4}\sqrt{7}$ units

Answer: C

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10. The equation of the curve lying in the first quadrant, such that the portion of the x - axis cut - off between the origin and the tangent at any point P is equal to the ordinate of P, is (where, c is an arbitrary constant)

A. $y = ce^{\frac{x}{y}}$

B. $ye^{\frac{x}{y}} = c$

C. $ye^{\frac{y}{x}} = c$

D. $y = ce^{\frac{y}{x}}$

Answer: B

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11. $\sum_{r=1}^{n} = \frac{r}{r^4 + r^2 + 1}$ is equal to

A. $\frac{n^2 + n}{2(n^2 + n + 1)}$

B. $\frac{n^2 + 2n}{2(n^2 + n + 1)}$

C. $\frac{2n^2 + n}{2(n^2 + n + 1)}$

D. $\frac{n^2 + n}{(n^2 + n + 1)}$

Answer: A

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12. If the integral $I = \int e^{x^2} x^3 dx = e^{x^2} f(x) + c$, where c is the constant of integration and $f(1) = 0$, then

the value of $f(2)$ is equal to

A. 4

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

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

D. 3

Answer: C

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13. The points on the curve $y = x^2$ which are closest to the point P(0, 1) are

A. $(\pm\sqrt{2}, 2)$

B. $\left(\pm\frac{1}{2}, \frac{1}{4}\right)$

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

D. $\left(\pm\frac{1}{4}, \frac{1}{16}\right)$

Answer: C

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14. Let ΔOAB be an equilateral triangle with side length unity (O being the origin). Also, M and N being closer to A and N being clower to B. position vectors

of A, B, M and N are $\vec{a}$, $\vec{b}$, $\vec{m}$ and $\vec{n}$ respectively, then the value of $\vec{m}.\ \vec{n}$ is equal to

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

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

C. $\frac{13}{18}$

D. $\frac{4}{9}$

Answer: C

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15. If A and B are two independent events such that $P(A) > \frac{1}{2}, P\left(A \cap B^C\right) = \frac{3}{25}$ and $P\left(A^C \cap B\right) = \frac{8}{25}$

, then $P(A)$ is equal to (where, A^c and B^c represent the complement of events A and B respectively)

A. $\frac{1}{5}$

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

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

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

Answer: B

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16. If A, B and C are square matrices of order 3 and $|A| = 2, |B| = 3$ and $|C| = 4$, then the value of $\left|3(adjA)BC^{-1}\right|$ is equal to (where, adj A represents the adjoint matrix of A)

A. 27

B. $\frac{27}{4}$

C. $\frac{81}{2}$

D. 81

Answer: D

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17. $\Sigma_{r=0}^{n}(n-r)(.^{n}C_{r})^{2}$ is equal to

A. $n^{2}\left(.^{2n-1}C_{n}\right)$

B. $n^{2}\left(.^{2n}C_{n-1}\right)$

C. $n^{2}\left(.^{2n-1}C_{n-1}\right)$

D. $m^{2}\left(.^{2n-2}C_{n}\right)$

Answer: D

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18. For a complex number z, the equation $z^{2}+(p+iq)zr+$ is $=0$ has a real root (where p, q, r, s are non - zero real numbers and $i^{2}=-1$), then

A. $pqr = r^2 + p^2 s$

B. $prs = q^2 + r^2 p$

C. $prs = p^2 + s^2 q$

D. $pqs = s^2 + q^2 r$

Answer: D

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19. The length of the normal chord which subtends an angle of 90° at the vertex of the parabola $y^2 = 4x$ is

A. $6\sqrt{3}$ units

B. $7\sqrt{2}$ units

C. $8\sqrt{2}$ units

D. $9\sqrt{2}$ units

Answer: A

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20. Let $f(x) = \begin{cases} \frac{2^{\frac{1}{x}}-1}{2^{\frac{1}{x}}+1} & : \quad x \neq 0 \\ 0 & : \quad x = 0 \end{cases}$, then $f(x)$ is

A. continuous and differentiable at x = 0

B. continuous but not differentiable at x = 0

C. differentiable but not continuous at x = 0

D. none of these

Answer: D

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21. If the total number of positive integral solution of $15 < x_1 + x_2 + x_3 \leq 20$ is k, then the value of $\frac{k}{100}$ is equal to

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22. If $3\tan^{-1}\left(\frac{1}{2+\sqrt{3}}\right) - \tan^{-1}.\frac{1}{3} = \tan^{-1}.\frac{1}{x}$, then the value of x is equal to

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23. If the straight lines $x + 2y = 3, 2x + 3y = 5$ and $k^2x + ky = -1$ represent a triangle which is right - angled, then the value of k are k_1 and k_2. The value of $\left|\frac{k_1 + k_2}{k_1 - k_2}\right|$ is

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24. Two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{1}$ intersect at a point P. If the distance of P from the plane $2x - 3y + 6z = 7$ is λ units, then the value of 49λ is equal to

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25. The area (in sq. units) bounded by $y = 2^x$ and $y = 2x - x^2$ from x = 1 to x = 2 is $k \log_2 e - l$, then the value of $\left|\frac{k}{l}\right|$ is equal to

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