



MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 105

Mathematics

1. If $R = (\sqrt{2} + 1)^{2n+1}$ where $[f]$ and $f = R - [R]$ denotes the greatest integer function and fractional part of R respectively, then the value of $[R]$ is equal to:

A. $f + \frac{1}{f}$

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

C. $\frac{1}{f} - f$

D. None of these

Answer: C



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2. The locus of the mid points of the chords of the ellipse $x^2/a^2 + y^2/b^2 = k, k > 0$, making equal intercepts on the coordinate axes, is:

A. $x = y$

B. $x + y = 0$

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

D. $x/a^2 + y/b^2 = 0$

Answer: C



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3. If the boolean expression $(p \wedge \neg r) \Rightarrow (r \vee q)$

is false and q and r are both false, then p is



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4. If A and B are square matrices of order 3×3 , then which of the following is true ?

A. $AB = O \Rightarrow A = O$ or $B = O$

B. $\det(2AB) = 8 \det(A) \det(B)$

C. $A^2 - B^2 = (A + B)(A - B)$

D. $\det(A + B) = \det(A) + \det(B)$

Answer: B



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5. If A , B and C are non-empty sets, then

$(A - B) \cup (B - A)$ equals

A. $(A \cup B) - B$

B. $A - (A \cap B)$

C. $(A \cup B) - (A \cap B)$

D. $(A \cap B) \cup (A \cup B)$

Answer: C



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6. 2 C of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ to the tangent drawn at a point R on the hyperbola If S & S' are the two foci of the hyperbola, then find the value of $(RS + RS')^2$

A. $4a^2 \left(1 + \frac{b^2}{a^2}\right)$

B. $a^2 \left(1 + \frac{b^2}{a^2}\right)$

C. $2a^2 \left(1 + \frac{b^2}{a^2}\right)$

D. None of these

Answer: A



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7. The sum of first 12 terms of an A.P. having its two middle terms equal to 1 and 7 respectively, is equal to:

A. 24

B. 36

C. 48

D. 96

Answer: C



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8. A and B are events such that $P(A \cup B) = \frac{3}{4}$
and $P(A \cap B) = \frac{1}{4}$, $P(\bar{A}) = \frac{2}{3}$, then

$P(\bar{A} \cap B)$ is:

A. $\frac{5}{12}$

B. $\frac{3}{8}$

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

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

Answer: A



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9. If the image of the point A (1, 2, -3) in the plane

$2x + 3y - z = 8$ measured parallel to the line

$\frac{x}{1} = \frac{1 - y}{1} = \frac{z}{2}$ is B, then AB is equal to:

A. $\sqrt{6}$

B. $\sqrt{24}$

C. $2\sqrt{66}$

D. $\sqrt{66}$

Answer: B



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10. For a given integer k , in the interval

$\left[2\pi k + \frac{\pi}{2}, 2\pi k - \frac{\pi}{2}\right]$ the graph of $\sin x$ is:

- A. increasing from -1 to 1
- B. decreasing from -1 to 0
- C. decreasing from 0 to 1
- D. None of these

Answer: A



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11. Two circles C_1 and C_2 on Argand plane represented by $|z + 1| = 3$ and $|z - 2| = 7$ respectively. If a variable circle $|z - z_0| = r$ be inside circle C_2 such that it touches circle C_1 externally and circle C_2 internally, then locus of z_0 describes a conic C whose eccentricity is equal to:

A. $\frac{1}{10}$

B. $\frac{3}{10}$

C. $\frac{5}{10}$

D. $\frac{7}{10}$

Answer: B



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12.
$$\lim_{x \rightarrow \infty} \left(\frac{p^{1/x} + q^{1/x} + r^{1/x} + s^{1/x}}{4} \right)^{3x},$$

where $p, q, r, s > 0$ is equal to:

A. $pqrs$

B. $(pqrs)^3$

C. $(pqrs)^{3/2}$

D. $(pqrs)^{3/4}$

Answer: D



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13.

Consider

$$f(x) = px^2 + qx + r, p > 0, q < 0, r > 0, \quad \text{and}$$

$q^2 > 4pr$, then number of points where $|f(|x|)|$ is not differentiable is:

A. 1

B. 3

C. 5

D. 7

Answer: C



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14. If $\int \frac{1 - 2019 \cos^2 x}{(\sin x)^{2019} \cos^2 x} dx = \tan x \cdot f(x) + C$

where 'C' is an integral constant then

$f\left(\frac{\pi}{2}\right) + f'\left(\frac{\pi}{2}\right) + f\left(-\frac{\pi}{2}\right)$ is equal to:

A. 3

B. 1

C. 0

D. -1

Answer: C



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15. The circle passing through $(1, -2)$ and touching the axis of x at $(3, 0)$. Then which of the following points lie on the circle.

A. $(5, -2)$

B. $(-2, 5)$

C. $(-5, 2)$

D. $(2, -5)$

Answer: A



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16. The area of the region bounded by two parabolas $y = x^2$ and $x = y^2$ is:

A. $\frac{1}{4}$ sq. unit

B. $\frac{1}{3}$. Sq unit

C. 4 sq. unit

D. 3 sq. unit

Answer: B



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17. Find the value of $\sin^{-1}\left(\frac{\sin(4\pi)}{3}\right)$

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

B. $\frac{4i}{5}$

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

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

Answer: D



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18. A ray of light coming along the line $x + y - 2 = 0$ gets reflected from the line $2x - y + 1 = 0$ and goes along the line $ax + by - 12 = 0$ then

A. $a + b = 6$

B. $b - a = 8$

C. $a/b = 7$

D. $b \times a = 7$

Answer: D



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19. The differential equation:

$$(x \cot y + \ln(\cos x))dy + (\ln(\sin y) - y \tan x)dx = 0$$

general solution as :

A. $(\sin x)^y (\cos y)^x = c$

B. $(\sin y)^x (\cos y)^y = c$

C. $(\sin x)^y (\sin y)^x = c$

D. $(\cot x)^y (\cot y)^x = c$

Answer: B



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20. $3^n > n^3$ is true for (where $n \in \mathbb{N}$)

A. $n > 2$

B. $n \geq 3$

C. $n \geq 4$

D. $n < 4$

Answer: C



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21. The differentiable functions f , g and h such that:

$$f'(x) = g(x), g'(x) = h(x), h'(x) = f(x)$$

$f(0) = 1, g(0) = 0 = h(0)$ find:

$$[f(x)]^3 + [g(x)]^3 + [h(x)]^3 - 3f(x)g(x)h(x) \text{ at } x = 7.$$



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22. Consider the word ALLAHABAD. Let p and q represent the number of words formed from the letters of the word ALLAHABAD in which vowels occupy the even positions and the words in which two L are not together, respectively. Find $\frac{q}{p}$



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23. If -9 is a root of the equation $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$,

then find the sum of other two roots.



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24. A continuous function f satisfies

$$x^2 + (f(x) - 4\sqrt{2} + 2)x + 6 - 2\sqrt{2} - \sqrt{2}f(x) = 0$$

$x \in \mathbb{R} - \{\sqrt{2}\}$, then the value of $|f(3\sqrt{2})|$ is:



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25. Consider the a, b and c be three non-zero vectors such that c is a unit vector perpendicular to both a and b . If the angle between a and b be $\frac{\pi}{2}$ and $[abc]^2 = k|a|^2|b|^2$ then k is equal to:



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26. Let $f: R \rightarrow R$ be a function defined by

$$f(x) = \begin{cases} [x] & x \leq 2 \\ 0 & x > 2 \end{cases}, \text{ where } [x] \text{ denotes the}$$

greatest integer function. If

$$I = \int_{-1}^2 \frac{x f(x^2)}{2 + f(x+1)} dx, \text{ then find the value of } 2I$$



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27. In a right angled triangle

$$\triangle ABC, C = \frac{\pi}{2}, s - a = 10, s - b = 3 \text{ find } s.$$



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28. Evaluate: $\frac{1}{\sin\left(\frac{1}{4} \frac{\sin^{-1} \sqrt{63}}{8}\right)}$, taking $\sqrt{2} = 1.41$



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29. The A.M. of the series 1,5,9,13,..., $(4n - 3)$ is 29.

Find the value of n.



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30. If x is rational and $4\left(x^2 + \frac{1}{x^2}\right) + 16\left(x + \frac{1}{x}\right) - 57 = 0$, then the positive integral value of # is equal to:



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