MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 106

Mathematics

1. In the expression $\frac{1+2x^2}{1+x}, |x| < 1$, the coefficient of x^8 is:

A. -1

B. 1

C. 2

D. -2

Answer: A

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2. Statement i The chord of ellipse $x^2 + y^2 + xy = 1$ through origin is bisected at origin.

Statement II The centre of the ellipse is a point through every chord is bisected.

A. Both Statement I and Statement II are true and the statement II is the correct explanation of the Statement I

B. Both Statement I and Statement II are true but the Statement II is not the correct explanation of the Statement I

C. Statement I is true and but Statement II is false

D. Statement I is false but Statement II is true

Answer: A

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3. The contrapositive statement of the proposition, "If two numbers are not equal, then their squares are not equal." from the following options:

A. If the squares of two numbers are equal, then the numbers are equal

B. If the squares of two numbers are not equal, then the numbers are equal

C. If the squares of two numbers are equal, then the numbers are not equal

D. If squares of two numbers are not equal, then the numbers are not equal

Answer: A

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4. Matrix A such that $A^2 = 2A - I$, where I is the identity matrix. Then, for $n \geq 2$, A^n, A^n is equal to:

A. $nA - (n-1)I$

B. nAI

C. $2^{n-1}A - (n-1)I$

D. $2^{n-1}A - I$

Answer: A

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5. If A = {2, 4, 5}, B = {7, 8, 9}, then n(A x B) is equal to

A. 6

B. 9

C. 3

D. 0

Answer: B

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6. The equation to the hyperbola having its eccentricity 2 and the distance between its foci is 8, is :

A. $\frac{x^2}{12} - \frac{y^2}{4} = 1$

B. $\frac{x^2}{4} - \frac{y^2}{12} = 1$

C. $\frac{x^2}{8} - \frac{y^2}{2} = 1$

D. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

Answer: B

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7. A pack of playing cards was found to contain only 51 cards. If the first 13 cards, which are examined are all red, the probability that the missing

card is black is:

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

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

C. $\frac{2}{9}$

D. None of these

Answer: A

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8. The reflection of the plane $2x - 3y + 4z - 3 = 0$ in the plane $x - y + z - 3 = 0$ is the plane

A. $4x - 3y + 2z - 15 = 0$

B. $4x - 2y + z - 15 = 0$

C. $3x - 2y + 2z - 15 = 0$

D. None of the above

Answer: A

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9. The maximum area of a right angled triangle with hypotenuse h is :

A. $\frac{h^2}{2\sqrt{2}}$

B. $\frac{h^2}{2}$

C. $\frac{h^2}{\sqrt{2}}$

D. $\frac{h^2}{4}$

Answer: D

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10. If 2 = 1 + ai is a complex number, $a > 0$, such that z^3 is a real number.

Then the value of the sum $1 + z + z^2 + \ldots\ldots + z^{11}$ is equal to,

A. $1365\sqrt{3i}$

B. $-1365\sqrt{3}i$

C. $-1250\sqrt{3}i$

D. $1250\sqrt{3}i$

Answer: B

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11. $\lim_{x \to 1^{\log_2 2x}_{\log_x 5}}$ is equal to:

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

B. $e^{\log_2 5}$

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

D. $e^{\log_5 2}$

Answer: B

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12. The value of V in Rolle's theorem for the function $f(x) = \begin{cases} x^2 \cos(1/x) & x \neq 0 \\ 0 & x = 0 \end{cases}$ in the interval [-1, 1] is:

A. $-1/2$

B. $1/4$

C. 0

D. non-existence in the interval

Answer: C

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13. If $\int \sqrt{1+\sin x} + f(x)dx = \frac{2}{3}(1+\sin x)^{3/2} + c$, then $f(x)$ is equal to:

A. cos x

B. sin x

C. tan x

D. 1

Answer: A

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14. For the circle $x^2 + y^2 - 4x - 6y + 11 = 0$, find one end of the diameter if the other end is given by (3, 4).

A. (0,0)

B. (1,1)

C. (1,2)

D. (2,1)

Answer: C

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15. Assertion: The graph of $y^2 + 2xy + 40|x| = 400$ divides the plane into two regions. The area of bounded region is $800(\text{units})^2$.

Reason: The bounded region is a parallelogram.

A. If both [A] and [R] are true, and [R] is the correct explanation of [A].

B. If both [A] and [R] are true but [R] is not the correct explanation of [A].

C. If [A] is true but [R] is false

D. If [A] is false but [R] is true.

Answer: A

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16. Let $a = 2\tan^{-1}(\sqrt{2} - 1), b = 3\frac{\sin^{-1}1}{\sqrt{2}} + \sin^{-1}\left(-\frac{1}{2}\right)$ and $c = \frac{\cos^{-1}1}{3}$. Then

A. $a < b < c$

B. $a < c < b$

C. $c < b < a$

D. $a > c > b$

Answer: B

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17. Which of the following is the solution of the differential equation, $\frac{dy}{dx} = \frac{3x^2y^4 + 2xy}{x^2 - 2x^3y^3}$? (where c is arbitrary constant)

A. $x^2y^2 + \frac{x^2}{y} = c$

B. $x^3y^2 + \frac{x^2}{y} = c$

C. $x^3y^2 + \frac{y^2}{x} = c$

D. $x^2y^3 + \frac{x^2}{y} = c$

Answer: B

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18. Let $y = P(x) = x^2 + bx + c$ be a quadratic function such that x-axis is tangent to y = P (x). If b is positive, then the value of $\frac{b+2}{\sqrt{c}+1}$ is equal to:

A. 1

B. 2

C. 4

D. 8

Answer: B

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19. For natural number n, $(n!)^2 > n^n$, if and only if:

A. $n > 3$

B. $n > 4$

C. $n \geq 4$

D. $n \geq 3$

Answer: D

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20. If $f(x) = 7^{\log_x 7}$, where $x \in R^+ - \{1\}$, find $f'(7)$.

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21. How many unordered pairs (d_1, d_2) are there such that $d_1 d_2 = 7875, d_1 \neq 1, d_2 \neq 1$?

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22. If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_3 \\ a_3 & b_3 & c_3 \end{vmatrix} = 6$ and $\Delta' = \begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$. Find the value of Δ'

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23. Let $a > 0$ be a constant and a function f be defined as $f(x) = \frac{a^x}{1 + a^x}$. - Find the value of $f(\tan 1^\circ) + f(\tan 2^\circ) + \ldots\ldots + f(\tan 89^\circ) + f(\tan 91^\circ) + \ldots\ldots +$

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24. Consider the quadratic equation: $A\left(\sqrt{3} - \sqrt{2}\right)x^2 + \frac{B}{\sqrt{3} + \sqrt{2}}x + C = 0$ with α, β as its roots. If $A = \left(49 + 20\sqrt{6}\right)^{\frac{1}{4}}$, B = sum of the infinite G.PX as $8\sqrt{3} + \frac{8\sqrt{6}}{\sqrt{3}} + \frac{16}{\sqrt{3}} + \ldots . \infty$ and $|\alpha - \beta| = \left(6\sqrt{6}\right)^k$ where

$k = \log_6 10 - 2\log_6 \sqrt{5} + \log_6 \sqrt{\log_6 18 + \log_6 72}$, then the value of C/16 equals:

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25. If a and b are perpendicular vectors with $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3$ and $\vec{c} \times \vec{a} = 6$, then the least value of $\left|\vec{c} - \vec{a}\right|$

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26. The value of the definite integral $\int_{19}^{37} \left(\{x\}^2 + 3(\sin 2\pi x)\right) dx$, where {x} denotes the fractional part function.

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27. Solve: $\frac{1 - 4\sin 10^\circ . \sin 70^\circ}{2\sin 10^\circ}$

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28. How many solution does the equation $\cos^{10} x - \sin^{10} x = 1$ in $[-3\pi, 3\pi]$ have ?

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29. If 25% of the items are less than 40 and 25% are more than 60, then find the value of coefficient of quartile deviation.

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