MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 120

Mathematics

1. If $f(x) = \frac{x^3}{3} + \frac{ax^2}{2} + x + 5$ has negative point of minima then which of the following is true about a

A. $a < -1$

B. $a > -2$

C. $a < -2$

D. $a > 2$

Answer: D

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2. If $\frac{1}{x} + \frac{1}{y} = \frac{1}{2007}$ where $x < y$, then the number of positive integer pairs (x,y) is

A. 5

B. 6

C. 7

D. 8

Answer: C

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3. If p,q and r are three statements then $(p \to (q \to r) \Leftrightarrow [(p \wedge q) \to r)]$ is a

A. contigency

B. tautology

C. contradiction(fallacy)

D. None of the above

Answer: B

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4. Which of the following points passes through the

$ax + by + c = 0$, if

$$\begin{vmatrix} a & b+c & a^2 \\ b & c+a & b^2 \\ c & a+b & c^2 \end{vmatrix} = 0$$

A. $(1, -1)$

B. $(-1, -1)$

C. $(0, 1)$

D. $(1, 1)$

Answer: D

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5. If the matrix $b = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ then B^{1027} is equal to

A. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$

Answer: B

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6. From the point $(2, \sqrt{3})$ perpendicular tangents are drawn to the parabola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then the eccentricity of the hyperbola if the distance between the foci is 10 , is

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

B. $\sqrt{\frac{11}{3}}$

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

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

Answer: A

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7. If $y = x^2 + \dfrac{1}{x^2 + \dfrac{1}{x^2 + \dfrac{1}{x^2 + \ldots \infty}}}$, then the value of $\dfrac{dy}{dx}$ is

A. $\dfrac{2xy}{2y - x^2}$

B. $\dfrac{xy}{y + x^2}$

C. $\dfrac{xy}{y - x^2}$

D. $\dfrac{2xy}{2y + x^2}$

Answer: A

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8. Thre numbers are chosen at random without replacement from the set {1,2,3,.....,8}. Then the probability that their minimum is equal to order of differential equation $x^3\frac{d^3y}{dx^3}+x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=0,$ given their maximum is equal to degree of differential equation $y^2=2\frac{dy}{dx}\left(x+\sqrt[5]{\frac{dy}{dx}}\right)$, is ..

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

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

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

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

Answer: B

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9. In a class there are 55 students, the number of students studying different subjects are 23 in Mathematics, 24 in Physics, 19 in Chemistry, 12 in Mathematics and Chemistry, 7 in Physics and Chemistry and 4 in all the three subjects. then the

number of students who have taken exactly one subject is:

A. 6

B. 9

C. 7

D. 22

Answer: D

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10. Solve $\frac{3+\cot 76^\circ \cot 16^\circ}{\cot 76^\circ + \cot 16^\circ} =$

A. $\tan 16^\circ$

B. $\cot 76^\circ$

C. $\tan 44^\circ$

D. $\cot 44^\circ$

Answer: D

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11. Statemetn 1: the equation $3^{2x-4} + 4^{2x-4} = 25$ has only one solution x=3

Statement 2: The equation

$a^{f(x)} + b^{f(x)} = a^n + b^n (a, b \in R)$ has only one solution given by $f(x) = n$

A. Statement 1 is true, statement 2 is true, statement 2 is not the correct explanation for statement 1

B. Statement 1 is true, statement 2 is false

C. Statement 1 is false, statement 2 is true

D. Statement 1 is true, statement 2 is true, statement 2 is the correct explanation for statement 1

Answer: D

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12. If $|x| < 1$ then $\lim_{n \to \infty} \frac{x^n}{x^n + 1} = ?$

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

B. -2

C. 1

D. 0

Answer: D

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13. If Lagrange's mean value theorem is applicable to the function f(x) for $x \in [0, 2[$ where

$$f(x) = \begin{cases} 3 & x = 0 \\ -x^2 + a & 0 < lx < 1 \\ mx + b & 1 \leq x \leq 2 \end{cases}$$

Then the values of a,m and b is

A. $a = 3, m = -2, b = 0$

B. $a = 3, m = -2, b = 4$

C. $a = 3, m = 2, b = 0$

D. $a = 4, m = 1, b = 1$

Answer: B

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14. Find the locus of the Orthocentre of the triangle formed by three tangents of the parabola $(4x-3)^2 = -64(2y+1)$

A. $y = \frac{-5}{2}$

B. $y = 1$

C. $x = \frac{7}{4}$

D. $y = \frac{3}{2}$

Answer: D

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15. The value of $\int \sqrt{\frac{\cos x \cos^3 x}{1-\cos^2 x}} dx$ is equal to

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

B. $\frac{3}{2}\sin^{-1}\left(\cos^{\frac{3}{2}} x\right) + C$

C. $\frac{2}{3}\cos^{-1}\left(\cos^{\frac{3}{2}} x\right) + C$

D. None of these

Answer: C

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16. Find the value of $Lt_{n\to\infty} \sum_{r=1}^{r=n} \frac{1}{-ne^{\frac{r}{n}}}$

A. $1 - e$

B. $e - 1$

C. e

D. $e + 1$

Answer: B

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17. Find the equation of a circle which is drawn on the major axis of the ellipse $9x^2 + 16y^2 = 144$ as diameter.

A. $x^2 + y^2 = 4$

B. $x^2 + y^2 = 3$

C. $x^2 + y^2 = 16$

D. $x^2 + y^2 = 9$

Answer: C

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18. The particular solution of the differential equation $xy\frac{dy}{dx} = \frac{1+y^2}{1+x^2}\left(1+x+x^2\right)$ given that when x=1, y=0 is .....

A. $\ln \sqrt{1+y^2} = In(x) + \tan^{-1}(x) - \frac{\pi}{2}$

B. $In\left(\frac{1+y^2}{x^2}\right) = 2\tan^{-1}(x) - \frac{\pi}{2}$

C. $In\left(\frac{1+y^2}{x^2}\right) = \frac{\pi}{4} - 2\tan^{-1}x$

D. $In\left(\frac{1+y^2}{x^2}\right) = \tan^{-1}(x) - \frac{\pi}{4}$

Answer: B

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19. If $\frac{(|x|-1)(|x|-2)}{(|x|-3)} \geq 0$ then x lies in

A. $x \in [1,2] \cup [3,\infty)$

B. $x \in [-\infty, -3] \cup [-2, -1]$

C. $x \in (-\infty, -3) \cup [-2, -1] \cup (3, \infty)$

D.

$x \in (-\infty, -3) \cup [-2, -1] \cup [1, 2] \cup (3, \infty)$

Answer: D

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20. A man is standing on the top of building of height 5 m. If he subtends equal angles at a point on the ground distant 13 m from the base of the building then the height of the man is

A. $\frac{485}{169}$m

B. $\frac{785}{144}$m

C. $\frac{970}{36}$m

D. $\frac{485}{72}$m

Answer: D

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21. If the coefficients of 2nd , 3rd and 4th terms in the expansion of $(1+x)^{2n}$ are in A.P. then find the value of $2n^2 - 9n + 8$.

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22. Let m,n,p,q represent the lengths of the tangent, subtangent, normal and subnormal to the curve $y = x^2 + x - 1$ at(1,1). Evaluate $\frac{9m^2}{p^2} + nq$

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23. If the three planes

$x = 5, 2x - 5ay + 3z = 2$ and $3bx + y - 3z = 0$

contains a common lines then find the value of

$\left| \frac{1}{a+b} \right|$

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24. If the A.M. of two numbers is greater than G.M. by 2 and the ratio of the numbers is 4:1, then find the sum of two numbers.

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25. If α and β are roots of $x^2 - 4x + 8 = 0$ and $\alpha^{24} + \beta^{24} = 2^k(\cos p\pi + i \sin p\pi)$, then pressure k+p.

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26. Let $I - \int\left(\frac{x}{\cos x + x \sin x}\right)^2 dx$. (where

$= (\sin x - x \cos x)^m$

$. (x \sin x + \cos x)^n + c$

c is constant of integration) then the value of

$3m - 2n$ is

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27. Let $f(x) = -(1 + x), (x < -1)$

$= -|x| + 1, -1 \leq x < 1$

$= x - 1, x \geq 1$

Find the area bounded by

$y = f(x), x = 2, x = -2, y = 1$

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28. If $f(x) = \sin^{-1}(x + 2019)$ and $-\cos^{-1}(x + 2021)$

$g(x) = \sin^{-1}(x + 2017)$ and x_1, x_2

$+\cos^{-1}(x + 2019)$

lies in domain of $f(x)$ & $g(x)$ respectively then

$$\left| \lim_{x \to x_1 + x_2} \frac{\sin(x - 2x_1 - 2) - \sin(2x - 3x_2 + 2016)}{\tan(x - x_1 - x_2)} \right|$$

is equal to

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29. Let C_1 and C_2 be the centres of the circles

$\omega_1 : x^2 - 2x + y^2 = 0$

$\omega_2 : x^2 + y^2 + 4x + 7y + 16 = 0$

respectively. The line joining C_1 and C_2 intersects the circle ω_1 and ω_2 at Q and P respectively. If (p,q) is the centre of the circle drawn on PQ as a diameter, then find $\frac{q}{p}$

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30. Find the number of integer values of m for which the x-coordinate of point of intersection of

the lines reperesented by $3x + 4y = 1$ and $y = mx + 1$ is also an integer.

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