MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 108

Mathematics

1. For $f(x) = x^3 + bx^2 + cx + d$, if $b^2 > 4c > 0$ and $b, c, d \in R$, then f(x)

A. is strictly increasing

B. is strictly decreasing

C. has a local maxima

D. is bounded

Answer: C

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2. Let f(x) be a differentiable function such that $\int_t^{t^2} xf(x)dx = \frac{4}{3}t^3 - \frac{4t}{3} \forall t \geq 0$, then f(1) is equal to

A. 4

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

C. 3

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

Answer: D

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3. If the area bounded by $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{64}{3}$ square units, then the positive value of a is

A. 1

B. 2

C. 3

D. 4

Answer: B

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4. If $\left(\frac{2+\cos x}{3+y}\right)\frac{dy}{dx}+\sin x=0$ and $y(0)=1$, then $y\left(\frac{\pi}{3}\right)$ is equal to

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

B. $\frac{7}{3}$

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

D. 1

Answer: C

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5. The area (in square units) of the triangle bounded by x = 4 and the lines $y^2-x^2+2x=1$ is equal to

A. 3

B. 6

C. 12

D. 9

Answer: D

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6. The angle between the tangents drawn from the point (2, 6) to the parabola $y^2 - 4y - 4x + 8 = 0$ is

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

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

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

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

Answer: C

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7. If $f(x) = \cos x + \sin x$ and $g(x) = x^2 - 1$, then $g(f(x))$ is injective in the interval

A. $\left[0, \frac{\pi}{2}\right]$

B. $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

C. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

D. $[0, \pi]$

Answer: B

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8. The value of $\lim_{x \to 0} \frac{(1+6x)^{\frac{1}{3}} - (1+4x)^{\frac{1}{2}}}{x^2}$ is equal to

A. 1

B. 2

C. -1

D. -2

Answer: D

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9. If $\int \frac{x}{x+1+e^x} dx = px + q\ln|x+1+e^x| + c$, where c is the constant of integration, then $p+q$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: A

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10. Let X_n denote the mean of first n natural numbers, then the mean of $X_1, X_2, \ldots\ldots\ldots\ldots\ldots, X_{100}$ is

A. 25

B. 50

C. 25.5

D. 25.75

Answer: D

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11. Let $f(x) = \dfrac{\sin x + 3\sin 3x + 5\sin 5x + 3\sin 7x}{\sin 2x + 2\sin 4x + 3\sin 6x}$, wherever defined. If $x_1 + x_2 = \dfrac{\pi}{2}$, where $f(x)$ is defined at x_1 and x_2, then $f^2(x_1) + f^2(x_2)$ is

A. $\cos^2 x$

B. $\sin^2 x$

C. 4

D. 1

Answer: C

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12. If two points A and B lie on the curve $y = x^2$ such that $\overrightarrow{OA}.\hat{i} = 1$ and $\overrightarrow{OB}.\hat{j} = 4$, where O is origin and A and B lie in the 1^{st} and 2^{nd} quadrant respectively, then $\overrightarrow{OA}.\overrightarrow{OB}$ is equal to

A. 0

B. 2

C. 4

D. 5

Answer: B

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13. A man alternately tosses a coin and throw a dice, beginning with the coin. The probability that he gets a head in coin before he gets a 5 or 6 in dice, is

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

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

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

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

Answer: A

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14. A plane P passes through the point $(1, 1, 1)$ and is parallel to the vectors $\vec{a} = -\hat{i} + \hat{j}$ and $\vec{b} = \hat{i} - \hat{k}$. The

distance of the point $\left(\frac{3\sqrt{3}}{2}, 3\sqrt{3}, 3\right)$ from the plane is equal to

A. $\sqrt{3}$ units

B. $\frac{9}{2}$ units

C. $3\sqrt{3}$ units

D. 3 units

Answer: B

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15. Let A and B two non singular matrices of same order such that $(AB)^k = B^k A^k$ for consecutive positive integral values of k, then AB^2A^{-1} is equal to

A. A^2

B. B

C. A

D. B^2

Answer: D

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16. The value of $\Sigma_{r=1}^{n}(-1)^{r+1}\frac{{}^{n}C_r}{r+1}\Big)$ is equal to

A. $-\frac{1}{n+1}$

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

C. $\frac{1}{n+1}$

D. $\frac{n}{n+1}$

Answer: D

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17. If α and β are the roots of the equation $x^2 + \alpha x + \beta = 0$ such that $\alpha \neq \beta$, then the number of integral values of x satisfying $||x - \beta| - \alpha| < 1$ is

A. 0

B. 1

C. 2

D. more than 2

Answer: C

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18. Given α and β are the roots of the quadratic equation $x^2 - 4x + k = 0 (k \neq 0)$. If $\alpha\beta, \alpha\beta^2 + \alpha^2\beta$ and $\alpha^3 + \beta^3$ are in geometric progression, then the value of k is equal to

A. 4

B. $\frac{16}{7}$

C. $\frac{3}{7}$

D. 12

Answer: B

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19. The equation $\cos^4 x - \sin^4 x + \cos 2x + \alpha^2 + \alpha = 0$ will have at least one solution, if

A. $-2 \leq \alpha \leq 2$

B. $-3 \leq \alpha \leq 1$

C. $-2 \leq \alpha \leq 1$

D. $-1 \leq \alpha \leq 2$

Answer: C

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20. The radius of the circle with centre at $(3, 2)$ and whose common chord with the cirlce

$C: x^2 + y^2 - 4x - 8y + 16 = 0$ is also a diameter of the circle C, is

A. 3 units

B. 2 units

C. 1 units

D. $\sqrt{3}$ units

Answer: A

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21. Let

$f(x) = [x]\{x^2\} + [x][x^2] + \{x\}[x^2] + \{x\}\{x^2\}, \forall x \in [0, 10]$

$[.]$ and $\{.\}$ the greatest integer and fractional part

functions respectively). The number of points of discontinuity of $f(x)$ is

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22. If the line $2x + \sqrt{6}y = 2$ touches the hyperbola $x^2 - 2y^2 = a^2$, then a^2 is equal to

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23. If $i^2 = -1$ and $\left(\frac{1+i}{\sqrt{2}}\right)^n = \left(\frac{1-i}{\sqrt{2}}\right)^m = 1, \forall n, m \in N,$ then the minimum value of $n + m$ is equal to

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24. If a, b and c are non - zero real numbers and if system of equations

$(a-1)x = y+z, (b-1)y = z+x$ and $(c-1)z = x+y$ have a non - trivial solutin, then $\frac{3}{2a} + \frac{3}{2b} + \frac{3}{2c}$ is equal to

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25. The number of quadratic polynomials $ax^2 + 2bx + c$ which satisfy the following conditions is k

(i) a, b, c are distinct

(ii) $a, b, c \in \{1, 2, 3, 4, \ldots..2001, 2002\}$

(iii) $x+1$ divides $ax + 2bx + c$ Then $\frac{k}{10^5}$ is equal to

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