MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 102

Mathematics

1. In the expansion of $(a+b)^n$, first three terms are 243, 810 and 1080 respectively, then the fourth term of the expansion is $(n \in N)$

A. 32

B. 720

C. 510

D. 420

Answer: B

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2. If $z = x + iy, \forall x, y \in R, i^2 = -1, xy \neq 0$ and $|z| = 2$, then the imaginary part of $\frac{z+2}{z-2}$ cannot be

A. 1

B. 3

C. 2

D. 4

Answer: A

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3. The number of permutations of the alphabets of the word "GOOGLE" in which O's are together but G's are separated, is

A. 24

B. 48

C. 72

D. 36

Answer: D

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4. If B, C are square matrices of same order such that $C^2 = BC - CB$ and $B^2 = -I$, where I is an identity matrix, then the inverse of matrix $(C - B)$ is

A. C

B. $C + B$

C. $C - B$

D. I

Answer: B

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5. The tangent drawn to the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$, at point P in the first quadrant whose abscissa is 5, meets the lines $3x - 4y = 0$ and $3x + 4y = 0$ at Q and R respectively. If O is the origin, then the area of triangle OQR is (in square units)

A. 6

B. 12

C. 3

D. 24

Answer: B

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6. Two natrual numbers are randomly chosen and multiplied, then the chance that their product is divisible by 3 is

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

B. $\frac{5}{9}$

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

D. $\frac{1}{9}$

Answer: B

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7. If α and β are the roots of the equation $x^2 + x + c = 0$ such that $\alpha + \beta, \alpha^2 + \beta^2$ and $\alpha^3 + \beta^3$ are in arithmetic progression, then c is equal to

A. 1

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

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

D. $\frac{4}{7}$

Answer: D

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8. In a harmonic progression $t_1, t_2, t_3, \ldots\ldots\ldots\ldots\ldots$, it is given that $t_5 = 20$ and $t_6 = 50$. If S_n denotes the sum of first n terms of this, then the value of n for which S_n is maximum is

A. 6

B. 7

C. 9

D. 10

Answer: A

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9. The locus of the centre of the circle which makes equal intercepts on the lines $x + y = 1$ and $x + y = 5$ is

A. $x - y = 2$

B. $x + y = 6$

C. $x + y = 3$

D. $x - y = 0$

Answer: C

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10. Consider the system of equations $\alpha x + y + z = p, x + \alpha y + z = q$ and $x + y + \alpha z = r$, then the sum of all possible distinct value(s) of α for which system does not possess a unique solution is

A. -2

B. 1

C. -1

D. 0

Answer: C

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11. The normal to the parabola $y^2 = 4x$ at $P(9, 6)$ meets the parabola again at Q. If the tangent at Q meets the directrix at R, then the slope of another tangent drawn from point R to this parabola is

A. 11

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

C. $\frac{3}{11}$

D. 3

Answer: B

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12. The number of points where $f(x) = \left|x^2 - 3|x| - 4\right|$ is non - differentiable is

A. 1

B. 2

C. 3

D. 4

Answer: C

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13. The complete set of values of α for which the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-3}{2} = \frac{y-5}{\alpha} = \frac{z-7}{\alpha+2}$ are

concurrent and coplanar is

A. $\{2, 3\}$

B. $\{0, 3\}$

C. $[-2, 3]$

D. R

Answer: D

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14. Let $f(x) = 2x + 1$ and $g(x) = \int \frac{f(x)}{x^2(x+1)^2} dx$. If $6g(2) + 1 = 0$ then $g\left(-\frac{1}{2}\right)$ is equal to

A. 4

B. -4

C. 3

D. 2

Answer: A

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15. Let $f(x)$ be a cubic function such that $f'(1) = f''(2) = 0$. If $x = 1$ is a point of local maxima of f(x), then the local minimum value of f(x) occurs at

A. $x = 0$

B. $x = 2$

C. $x = 4$

D. $x = 3$

Answer: D

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16. The maximum value of p for which the lines $3x - 4y = 2, 3x - 4y = 12, 12x + 5y = 7$ and $12x + 5y = p$ constitute the sides of a rhombous is

A. 33

B. 19

C. -19

D. 9

Answer: A

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17. The function $f: R \to R$ defined as $f(x) = \dfrac{x^2 - x + 1}{x^2 + x + 1}$ is

A. injective as well as sujective

B. injective but not surjective

C. surjective but not injective

D. neither injective nor surjective

Answer: D

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18. The value of $\lim_{x \to 0^+} \left\{ x^{x^2} + x^{(x^x)} \right\}$ is equal to

A. 0

B. 1

C. 2

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

Answer: B

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19. The area (in sq. units) bounded by $y = \ln x, y = \frac{x}{e}$ and y - axis is equal to

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

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

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

D. $\frac{3e}{2} - 1$

Answer: B

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20. Consider three vectors $\vec{p} = \hat{i} + \hat{j} + \hat{k}, \vec{q} = 3\hat{i} - \hat{j} + \hat{k}$ and $\vec{r} = \alpha\hat{i} + \beta\hat{j} + \lambda\hat{k}, \forall \alpha, \beta, \lambda \in R$. If $[\vec{p} \quad \vec{q} \quad \vec{r}]$ is maximum and $\left[\vec{r}\right] = 2\sqrt{6}$, then the value of $\alpha - \beta - \lambda$ is equal to

A. 8

B. 4

C. 0

D. -4

Answer: B

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21. If $\sin\theta + \sin^2\theta = 1$, then prove that $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 1 = 0$

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22. If $y = f(x)$ satisfies the differential equation $\frac{dy}{dx} + \frac{2x}{1+x^2}y = \frac{3x^2}{1+x^2}$ where $f(1) = 1$, then $f(2)$ is equal to

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23. If the variance of the first 50 odd natural numbers is V_1 and the variance of next 50 odd natural numbers is V_2, then $V_1 + V_2$ is equal to

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24. If $I_1 = \int_0^{\frac{\pi}{2}} e^{\sin x}(1 + x\cos x)dx$ and $I_2 = \int_0^{\frac{\pi}{2}} e^{\cos x}(1 - x\sin x)dx$, then $\left[\frac{I_1}{I_2}\right]$ is equal to (where $[x]$ denotes the greatest integer less than or equal to x)

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25. The number of solution of $\cos^2 x + \cos^2 2x = 2$ in $[0, 20]$ is equal to

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