



MATHS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 1

Mathematics

1. If the roots of the equation $ax^2 + bx + c = 0$ are in the ratio $m:n$ then

A. $mnb^2 = ac(m+n)^2$

B. $b^2(m+n) = mn$

C. $m+n = b^2mn$

D. $mnc^2 = ab(m+n)^2$

Answer: A



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2. The domain of definition of the function $y = 3e^{\sqrt{x^2-1}} \log(x-1)$ is

A. $(1, \infty)$

B. $[1, \infty)$

C. $R - \{1\}$

D. $(-\infty, -1) \cup (1, \infty)$

Answer: A



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3. The value of $\int_{-1}^1 (x - [x]) dx$, (where $[.]$ denotes greatest integer function) is

A. 0

B. 1

C. 3

D. 2

Answer: B



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4. A flag staff of 5m high stands on a building of 25m high. At an observer at a height of 30 m. The flag staff and the building subtend equal angles.

The distance of the observer from the top of the flag staff is

A. $\frac{5\sqrt{3}}{2}$ m

B. $5\sqrt{\frac{3}{2}}$ m

C. $5\sqrt{\frac{2}{3}}$ m

D. None of these

Answer: B



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5. If $R = \{(x, y) : x, y \in \mathbb{Z}, x^2 + y^2 \leq 4\}$ is a relation defined on the set \mathbb{Z} of integers, then write domain and range.

A. $\{0, 1, 2\}$

B. $\{0, -1, -2\}$

C. $\{-2, -1, 0, 1, 2\}$

D. None of these

Answer: C



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6. What will be the remainder when 5^{97} is divided by 52

A. 3

B. 5

C. 4

D. 0

Answer: B



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7. If $y = 4x - 5$ is a tangent to the curve $y^2 = px^3 + q$ at $(2, 3)$, then

A. $(2, 7)$

B. $(-2, 7)$

C. $(-2, -7)$

D. $(2, -7)$

Answer: D



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8. The number of discontinuities of the greatest integer function

$f(x) = [x]$, $x \in \left(-\frac{7}{2}, 100\right)$ is equal to

A. 104

B. 102

C. 104

D. 103

Answer: D



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9. The number of ways of dividing 15 men and 15 women into 15 couples each consisting a man and a woman is

A. 1960

B. 15!

C. $(15!)^2$

D. 14!

Answer: B



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10. If the general solution of the differential equation $y' = \frac{y}{x} + \phi\left(\frac{x}{y}\right)$, for some function ϕ is given by $y \ln|cx| = x$, where c is an arbitrary constant, then $\phi(2)$ is equal to (here $y' = \frac{dy}{dx}$)

A. -4

B. $-\frac{1}{4}$

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

D. 4

Answer: B



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11. If $\sin^{-1} \frac{1}{3} + \sin^{-1} \frac{2}{3} = \sin^{-1} x$, then the value of x is

A. 0

B. $\frac{(\sqrt{5} - 4\sqrt{2})}{9}$

C. $\frac{(\sqrt{5} + 4\sqrt{2})}{9}$

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

Answer: C



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12. If $x \neq y$, then for every natural number n , $x^n - y^n$ is divisible by

A. $x^2 - y^2$

B. $x + y$

C. $x - y$

D. None of these

Answer: C



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13. The area bounded by the curves

$$y = (x - 1)^2, y = (x + 1)^2 \text{ and } y = \frac{1}{4} \text{ is}$$

A. $\frac{1}{3}$ sq unit

B. $\frac{2}{3}$ sq unit

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

D. $\frac{1}{5}$ sq unit

Answer: A



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14. Number of roots of $\cos^2 x + \frac{\sqrt{3} + 1}{2} \sin x - \frac{\sqrt{3}}{4} - 1 = 0$ which lie in the interval $[-\pi, \pi]$ is

A. 2

B. 4

C. 6

D. 8

Answer: B



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15. Suppose that the side lengths of a triangles are three consecutive integers and one of the angles is twice another. The number of such triangles is/are

A. 1

B. 0

C. 4

D. 2

Answer: A



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16. Let $x = 33^n$. The index n is given a positive integral value at random.

The probability that the value of x will have 3 in the units place is

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

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

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

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

Answer: B



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17. If $y = \log_{10} x + \log_x 10 + \log_x x + \log_{10} 10$ then what is $\left(\frac{dy}{dx}\right)_{x=10}$ equal to?

A. $\frac{1}{x \log_e 10} - \frac{\log_e 10}{x(\log_e x)^2}$

B. $\frac{1}{x \log_e 10} - \frac{1}{x \log_{10} e}$

C. $\frac{1}{x \log_e 10} - \frac{1}{(\log_e x)^2}$

D. None of these

Answer: A

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18. If $|z| \geq 3$, then determine the least value of $\left|z + \frac{1}{z}\right|$.

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

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

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

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

Answer: C

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19. If a, b, c, d, e, f are in A.P., then $e - c$ is equal to

A. $2(c - a)$

B. $2(d - c)$

C. $2(f - d)$

D. $d - c$

Answer: B

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20. $\int \frac{\log(x+1) - \log x}{x(x+1)} dx$ is equal to :

A. $-\frac{1}{2} \left[\ln \left(\frac{x+1}{x} \right) \right]^2 + C$

B. $-\left[\{\ln(x+1)\}^2 - (\ln x)^2 \right] + C$

C. $-\ln \left[\ln \left(\frac{x+1}{x} \right) \right] + C$

$$D. -\ln\left(\frac{x+1}{x}\right) + C$$

Answer: A

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21. If $f(x)$ is a polynomial satisfying $f(x)f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ and $f(2) > 1$, then $\lim_{x \rightarrow 1} f(x)$ is

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22. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$, $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $A^{-1} = \left[\frac{1}{6}(A^2 + cA + dI) \right]$. Then value of c and d are

A. (6, -11)

B. (6, 11)

C. (-6, 11)

D. (6, - 11)

Answer: B



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23. The least value of the quadratic polynomial, $f(x) = (2p^2 + 1)x^2 + 2(4p^2 - 1)x + 4(2p^2 + 1)$ for real values of p and x is



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24. If A, B, C are in A.P and $B = \frac{\pi}{4}$ then $\tan A \tan B \tan C =$



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25. Find the distance of the point $(-1, 1)$ from the line $12(x + 6) = 5(y - 2)$.



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26. If the 2^{nd} , 5^{th} and 9^{th} terms of a non-constant arithmetic progression are in geometric progression, then the common ratio of this geometric progression is

A. 1

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

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

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

Answer: D



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27. All possible numbers are formed using the digits 1, 1, 2, 2, 2, 2, 3, 4, 4 taken all at a time. The number of such numbers in which the odd digits occupy even places is:

A. 175

B. 162

C. 180

D. 160

Answer: C



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28. Let w denote the words in the english dictionary. Define the relation R by: $R = \{(x, y) \in W \times W \mid \text{words } x \text{ and } y \text{ have at least one letter in common}\}$. Then R is: (1) reflexive, symmetric and not transitive (2) reflexive, symmetric and transitive (3) reflexive, not symmetric and transitive (4) not reflexive, symmetric and transitive

A. reflexive , symmetric and not transitive

B. reflexive,symmetric and transitive

C. reflexive , not symmetric and transitive

D. not reflexive , symmetric and transitive

Answer: A



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29. The value of a for which $ax^2 + \sin^{-1}(x^2 - 2x + 2) + \cos^{-1}(x^2 - 2x + 2) = 1$ has a real solution is

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

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

C. $-\frac{\pi}{2}$

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

Answer: C



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30. The general solution of the differential equation

$$(2x - y + 1)dx + (2y - x + 1)dy = 0 \text{ is -}$$

A. $x^2 + y^2 + xy - x + y = c$

B. $x^2 + y^2 - xy + x + y = c$

C. $x^2 - y^2 + 2xy - x + y = c$

D. $x^2 - y^2 - 2xy + x - y = c$

Answer: B



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31. The mean of five numbers is 0 and their variance is 2 .If three of those numbers are -1,1 and 2, then the other two numbers are

A. -5 and 3

B. -4 and 2

C. -3 and 1

D. -2 and 0

Answer: D



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32. The first integral term in the expansion of $\left(\sqrt{3} + 2^{\frac{1}{3}}\right)^9$, is

A. 2^{nd} term

B. 3^{rd} term

C. 4^{th} term

D. 5^{th} term

Answer: C



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33. If $\cos \alpha + \cos \beta = a$, $\sin \alpha + \sin \beta = b$ and $\alpha - \beta = 2\theta$, then $\frac{\cos 3\theta}{\cos \theta} =$

A. $a^2 + b^2 - 2$

B. $a^2 + b^2 - 3$

C. $3 - a^2 - 3$

D. $\frac{a^2 + b^2}{4}$

Answer: B



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34. If the image of the point (1,2,3) in the plane $2x + 3y - z = 7$ is the point (α, β, γ) , then the value of $\alpha + \beta + \gamma$ is equal to

A. -6

B. 10

C. 8

D. -4

Answer: A



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35. The value of $\int \frac{dx}{x(x^n + 1)}$ is equal to

A. $\frac{1}{n} \log_e \left(\frac{x^n}{x^n + 1} \right) + c$

B. $\frac{1}{n} \log_e \left(\frac{x^n + 1}{x^n} \right) + c$

C. $\log_e \left(\frac{x^n}{x^n + 1} \right) + c$

D. None of these

Answer: A



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36. If f is a function defined as $f(x) = x^2 - x + 5$, $f: \left(\frac{1}{2}, \infty\right) \rightarrow \left(\frac{19}{4}, \infty\right)$, and $g(x)$ is its inverse function, then $g'(7)$ is equal to

A. $-\frac{1}{13}$

B. $\frac{1}{13}$

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

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

Answer: C



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37. Let α and β be two roots of the equation $x^2 + 2x + 2 = 0$. Then $\alpha^{15} + \beta^{15}$ is equal to

A. -512

B. 128

C. 512

D. - 256

Answer: D



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38. The value of $f(0)$, such that $f(x) = \frac{1}{x^2}(1 - \cos(\sin x))$ can be made continuous at $x=0$, is

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

B. 2

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

D. 4

Answer: A



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39. The locus of the centre of the circle which cuts the circle $x^2 + y^2 - 20x + 4 = 0$ orthogonally and touches the line $x = 2$ is

A. $y^2 = 16x + 4$

B. $x^2 = 16y$

C. $x^2 = 16y + 4$

D. $y^2 = 16x$

Answer: D



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40. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines $x=4$, $y=4$ and the coordinate axes. If S_1, S_2, S_3 are the areas of these parts numbered from top to bottom, respectively, then

A. 2 : 1 : 2

B. 1 : 1 : 1

C. 1:2:1

D. 1:2:3

Answer: B



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41. The value of

$$\lim_{x \rightarrow \infty} \frac{2x^{1/2} + 3x^{1/3} + 4x^{1/4} + \dots + nx^{1/n}}{(2x-3)^{1/2} + (2x-3)^{1/3} + \dots + (2x-3)^{1/n}} \text{ is}$$

A. $\sqrt{2}$

B. 2

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

D. 0

Answer: A



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42. If $f(x) = x^3 + 4x^2 + ax + 5$ is a monotonically decreasing function of x in the largest possible interval $(-\infty, -2/3)$, then the value of a is

A. $\lambda = 4$

B. $\lambda = 2$

C. $\lambda = -1$

D. λ has no real value

Answer: A



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43. If the angles of elevation of the top of tower from three collinear points A , B and C , on a line leading to the foot of the tower, are 30° , 45° and 60° respectively, then the ratio, $AB : BC$ is

A. $2 : 3$

B. $\sqrt{3} : 1$

C. $\sqrt{3} : \sqrt{2}$

D. $1 : \sqrt{3}$

Answer: B

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44. A unit vector in the xy -plane that makes an angle of $\frac{\pi}{4}$ with the vector $\hat{i} + \hat{j}$ and an angle of with the vector $3\hat{i} - 4\hat{j}$ is

A. $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

B. $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

C. $\frac{2\hat{i} - \hat{j}}{\sqrt{2}}$

D. None of these

Answer: D

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45. If $x = \frac{1 - t^2}{1 + t^2}$ and $y = \frac{2t}{1 + t^2}$, then $\frac{dy}{dx}$ is equal to

A. $-\frac{y}{x}$

B. $\frac{y}{x}$

C. $-\frac{x}{y}$

D. $\frac{x}{y}$

Answer: C



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46. Let A be a matrix of order 3×3 such that $\det(A) = 2$, $B = 2A^{-1}$ and

$C = \frac{(\text{adj}A)}{\sqrt[3]{16}}$, then the value of $\det(A^3 B^2 C^3)$ is



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47. Given $f(x)$ where

$$= \begin{cases} x|x| & \text{for } x \leq -1 \\ [x + 1] + [1 - x] & \text{for } -1 < x < 1, \quad [.] \text{ denotes the greatest} \\ -x|x| & \text{for } x \geq 1 \end{cases}$$

integer function. If $I = \int_{-2}^2 f(x) dx$, then $|3I| =$

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48. The line $3x + 2y = 24$ meets the y-axis at A and the x-axis at B . The perpendicular bisector of AB meets the line through $(0, -1)$ parallel to the x-axis at C . If the area of triangle ABC is A , then the value of $\frac{A}{13}$ is _____

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49. The minimum number of times a fair coin needs to be tossed, so that the probability of getting at least two heads is at least 0.96, is _____.

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50. Consider the equation $x^2 + 2x - n = 0$ where $n \in \mathbb{N}$ and $n \in [5, 100]$. The total number of different values of n so that the given equation has integral roots is



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51. The value of $I = \int_{-1}^1 [x \sin(\pi x)] dx$ is (where $[.]$ denotes the greatest integer function)

A. π

B. 2π

C. 0

D. $-\pi$

Answer:



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52. The area bounded by the curve $y^2 = 1 - x$ and the lines $y = \frac{[x]}{x}$, $x = -1$, and $x = \frac{1}{2}$ is

A. $\left(\frac{3}{\sqrt{2}} - \frac{11}{6}\right)$ sq. units

B. $\left(3\sqrt{2} - \frac{11}{4}\right)$ sq. units

C. $\left(\frac{6}{\sqrt{2}} - \frac{11}{5}\right)$ sq. units

D. none of these

Answer: A



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53. The curve satisfying the differential equation $\frac{dx}{dy} = \frac{x + 2yx^2}{y - 2x^3}$ and passing through (1, 0) is given by

A. $x^2 + y^2 = 1$

B. $x^2 + y^2 + \frac{y}{x} = 1$

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

D. $x^2 - y^2 = 1$

Answer: B



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54. The line $\frac{x}{a} + \frac{y}{b} = 1$ touches the curve $y = be^{-x/a}$ at the point

A. (0,0)

B. (0,a)

C. (0,b)

D. (b,0)

Answer: C



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55. Six distinct numbers are chosen from the first 10 natural numbers. The probability that 6 is the third largest of those chosen number is

A. $\frac{2}{7}$

B. $\frac{5}{21}$

C. $\frac{10}{63}$

D. $\frac{16}{63}$

Answer: A



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56. A plane $P = 0$, which is perpendicular to line $\frac{x-2}{2} = \frac{y+2}{2} = \frac{z-1}{1}$ is passing through the point at which the above line meets the plane $x + y + z = 21$, then the distance of plane $P = 0$ from origin is

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

B. 5

C. $\frac{32}{3}$

D. $\frac{37}{3}$

Answer: D



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57. If $A^2 = A$, then $(I + A)^4$ is equal to

A. $I + 15A$

B. $1 + 7A$

C. $1 + 8A$

D. $1 + 11A$

Answer: A



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58. The mean and variance of a data set comprising 15 observations are 15 and 5 respectively. If one of the observation 15 is deleted and two new observations 6 and 8 are added to the data, then the new variance of resulting data is

A. 10.3715

B. 11.8125

C. 13.25

D. 5.7516

Answer: B



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59. If $A = \{x : x = 6^n - 5n - 1, n \in N\}$ and $B = \{x : x = 25(n - 1), n \in N\}$, then

A. $A = B$

B. $B \subset A$

C. $A \subseteq B$

D. $B \subseteq A$

Answer: C



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60. If $f(\tan x) = \cos 2x$, $x \neq (2n + 1)\frac{\pi}{2}$, $n \in I$ then incorrect statement is

A. $f(x)$ is an even function

B. $f(x)$ is an odd function

C. Range of $f(x)$ is $[-1, 1]$

D. Domain of $f(x)$ is $x \in R$

Answer: A



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61. The value of $\lim_{x \rightarrow \pi} \frac{\tan(\pi \cos^2 x)}{\sin^2 x}$ is equal to

A. 1

B. π

C. $-\pi$

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

Answer: C



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62. If $f(x) = \left(\frac{2+x}{1+x}\right)^{1+x}$, then $f'(0)$ is equal to

A. $2 \log 2$

B. $\log 2$

C. $3 \log 2 - 1$

D. $2 \log 2 - 1$

Answer: D



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63. Total number of lines touching atleast two circles of the family of four circles $x^2 + y^2 \pm 8x \pm 8y = 0$ is

A. 8

B. 10

C. 12

D. 14

Answer: D



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64. The locus of the middle points of the chords of the parabola $y^2 = 4ax$, which passes through the origin is :

A. $y^2 = ax$

B. $y^2 = 2ax$

C. $y^2 = 4ax$

D. $x^2 = 4ay$

Answer: B



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65. A flagstaff stands vertically on a pillar, the height of the flagstaff being double the height of the pillar. A man on the ground at a distance finds that both the pillar and the flagstaff subtend equal angles at his eyes. The ratio of the height of the pillar and the distance of the man from the pillar is

A. $\frac{\sqrt{3}}{1}$

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

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

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

Answer: C



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66. If $z = 3 - 4i$ then $z^4 - 3z^3 + 3z^2 + 99z - 95$ is equal to



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67. If the roots of the equation $x^3 + bx^2 + cx + d = 0$ are in arithmetic progression, then b, c and d satisfy the relation

A. $2b^2 - 27d = 9bc$

B. $2b^3 - 27d = 9bc$

$$C. 2b^2 + 27d = 9bc$$

$$D. 2b^3 + 27d = 9bc$$

Answer: D



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68. In the expression of $\left(x^{\frac{4}{5}} + x^{-\frac{1}{5}}\right)^n$, the coefficient of the 8^{th} and 19^{th} terms are equal. The term independent of x is given by

A. ${}^{27}C_{21}$

B. ${}^{25}C_{20}$

C. ${}^{25}C_{21}$

D. ${}^{27}C_{22}$

Answer: B



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69. In the interval $(0, 2\pi)$, sum of all the roots of the equation

$$\sin\left(\pi \log_3\left(\frac{1}{x}\right)\right) = 0 \text{ is}$$

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

B. 4

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

D. $\frac{13}{3}$

Answer: C



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70. There are 3 oranges, 5 apples and 6 mangoes in a fruit basket.

Number of ways in which at least one fruit can be selected from the

basket is

A. 168

B. 167

C. 125

D. 124

Answer: B

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71. If $\int \frac{x^{pq-p-1}}{(x^p+1)^q} dx = 2 \frac{(1+x^{-p})^{1-q}}{\lambda p(q-1)} + c$ ($p, q \in N - \{1\}$), then the value of λ is (here, c is an arbitrary constant)

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72. The smallest possible natural number n , for which the equation $x^2 - nx + 2014 = 0$ has integral roots, is

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73. If $f(x) = \begin{cases} \lambda\sqrt{2x+3} & 0 \leq x \leq 3 \\ \mu x + 12 & 3 < x \leq 9 \end{cases}$ is differentiable at $x = 3$, then the value of $\lambda + \mu$ is equal to

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74. Let in $\triangle ABC$ coordinates of vertex A is (0,0). Equation of the internal angle bisector of $\angle ABC$ is $x + y - 1 = 0$ and mid-point of BC is (1,3). The ordinate of vertex C is

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75. Let the maximum and minimum value of the expression $2\cos^2\theta + \cos\theta + 1$ is M and m respectively, then the value of $\left[\frac{M}{m}\right]$ is (where $[\cdot]$ is the greatest integer function)

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76. The function $f(x) = \tan x + \frac{1}{x}$, $\forall x \in \left(0, \frac{\pi}{2}\right)$ has

- A. one local maximum
- B. one local minimum
- C. one local maximum and one minimum
- D. no local maximum of minimum

Answer: B



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77. The possible values of n for which the equation $nx^2 + (2n - 1)x + (n - 1) = 0$ has roots of opposite sign is/are by

- A. no value of n
- B. all values of n
- C. $-1 < n < 0$
- D. $0 < n < 1$

Answer: D



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78. The value of the integral $I = \int_1^2 t^{[\{t\}] + t} (1 + \ln t) dt$ is equal to ([.] and {.} denotes the greatest integer and fractional part function respectively)



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79. The solution of the differential equation $x dy + \frac{y}{x} dx = \frac{dx}{x}$ is (where, c is an arbitrary constant)

A. $y = 1 + ce^{1/x}$

B. $y = ce^{1/x}$

C. $y = ce^{1/x} - 1$

D. $xy = 1 - ce^{1/x}$

Answer: A



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80. In an experiment with 9 observation on x , the following results are available $\Sigma x^2 = 360$ and $\Sigma x = 34$. One observation that was 8, was found to be wrong and was replaced by the correct value 10, then the corrected variance is

A. $\frac{250}{9}$

B. 28

C. $\frac{240}{9}$

D. 26

Answer: B



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81. If two parabolas $y^2 - 4a(x - k)$ and $x^2 = 4a(y - k)$ have only one common point P, then the equation of normal to $y^2 = 4a(x - k)$ at P is

A. $y + x = 4a$

B. $y + x = 2a$

C. $y + x = 4$

D. $y + x = 2$

Answer: A



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82. If a , b & $3c$ are in arithmetic progression and a , b & $4c$ are in geometric progression, then the possible value of $\frac{a}{b}$ are

A. $\left\{ \frac{2}{3}, 2 \right\}$

B. $\left\{ \frac{3}{2}, \frac{1}{2} \right\}$

C. $\left\{ \frac{2}{3}, \frac{3}{2} \right\}$

D. $\left\{ \frac{1}{2}, 2 \right\}$

Answer: B



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83. The number of terms in the expansion of $\left(5^{\frac{1}{6}} + 7^{\frac{1}{9}}\right)^{1824}$ which are integers is

A. 100

B. 101

C. 102

D. 103

Answer: C



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84. The number of ways in which 10 balls can be selected from 10 identical green balls, 10 identical blue balls and 9 identical red balls are

- A. 63
- B. 64
- C. 65
- D. 66

Answer: C



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85. Consider the function $f(x) = \cos^{-1}([2^x]) + \sin^{-1}([2^x] - 1)$, then (where $[.]$ represents the greatest integer part function)

- A. Domain of $f(x)$ is $x \in (-\infty, 0]$
- B. Range of $f(x)$ is singleton
- C. $f(x)$ is an even function

D. $f(x)$ is an odd function

Answer: B



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86. If A & B are two sets such that $n(A \times B) = 60$ & $n(A) = 12$ also $n(A \cap B) = K$, then the sum of maximum & minimum possible value of K is

A. 17

B. 12

C. 5

D. 7

Answer: C



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87. The value of $\lim_{x \rightarrow 0^-} \frac{2^{1/x} + 2^{3/x}}{3(2^{1/x}) + 5(2^{3/x})}$ is

A. $1/3$

B. $1/5$

C. 1

D. $1/4$

Answer: A



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88. If $f(x) = x^3 + 3x + 1$ and $g(x)$ is the inverse function of $f(x)$, then the value of $g'(5)$ is equal to

A. 3

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

C. $(1)/(6)$

D. 6

Answer: C



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89. The contrapositive of the statement: "If the weather is fine then my friends will come and we go for a picnic".

A. The weather is fine but my friends will not come or we do not go for a picnic.

B. If my friends do not come or we do not go for picnic then weather will not be find.

C. If the weather is not fine then my friends will not come or we do not go for a picnic.

D. The weather is not fine but my friends will come and we go for a picnic.

Answer: B



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90. Lines L_1 & L_2 are rotating in an anticlockwise direction about the points $A(-2, 0)$ and $B(2, 0)$ respectively in such a way that the speed of angle of rotation of line L_2 is double as that of L_1 . Initially equations of both lines are $y = 0$. If the angle of rotation of line L_2 varies between 0 to $\frac{\pi}{2}$, then the locus of point of intersection P of lines L_1 & L_2 is part of a circle whose radius is equal to

- A. 2 units
- B. 4 units
- C. 6 units
- D. 8 units

Answer: B

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91. The value of the integral $\int e^{3 \sin^{-1} x} \left(\frac{1}{\sqrt{1-x^2}} + e^{3 \cos^{-1} x} \right) dx$ is equal to

(where, c is an arbitrary constant)

A. $\frac{e^{3\sqrt{\sin^{-1} x}}}{3} + xe^{\frac{3\pi}{2}} + c$

B. $e^{\sqrt{\sin^{-1} x}} + e^{\pi/2} + c$

C. $\frac{e^{3 \sin^{-1} x}}{3} + xe^{\frac{3\pi}{2}} + c$

D. $e^{\frac{\pi}{2}} + e^x \left(\frac{\pi}{2} \right) + c$

Answer: C



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92. If the locus of the foot of the perpendicular drawn from centre upon any tangent to the ellipse $\frac{x^2}{40} + \frac{y^2}{10} = 1$ is $(x^2 + y^2)^2 = ax^2 + by^2$, then $(a - b)$ is equal to

A. 10

B. 20

C. 25

D. 30

Answer: D



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93. Let $M = \begin{bmatrix} a & b & c \\ d & e & f \\ 1 & 1 & 1 \end{bmatrix}$ and $N = \frac{M^2}{2}$. If $(a - b)^2 + (d - e)^2 = 36$,

$$(b - c)^2 + (e - f)^2 = 64,$$

$(a - c)^2 + (d - f)^2 = 100$, then value of $|N|$ is equal to

A. 1152

B. 48

C. 144

D. 288

Answer: D



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94. A small pack of cards consists of 5 green cards 4 blue cards and 3 black cards. The pack is shuffled through and first three cards are turned face up. The probability that there is exactly one card of each colour is :

A. $\frac{9}{55}$

B. $\frac{4}{11}$

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

D. $\frac{8}{55}$

Answer: C



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95. Let \vec{a} , \vec{b} , \vec{c} be three vectors of magnitude 3, 4, 5 respectively, satisfying $\left| \left[\vec{a} \ \vec{b} \ \vec{c} \right] \right| = 60$. If $\left(\vec{a} + 2\vec{b} + 3\vec{c} \right) \cdot \left((\vec{a} \times \vec{c}) \times \vec{b} + \vec{b} \right) = \lambda$ then λ is equal to

A. 16

B. 32

C. 20

D. 40

Answer: B

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96. Let $Z = re^{i\theta}$ ($r > 0$ and $\pi < \theta < 3\pi$) is a root of the equation

$$Z^8 - Z^7 + Z^6 - Z^5 + Z^4 - Z^3 + Z^2 - Z + 1 = 0.$$

the sum of all values of θ is $k\pi$. Then k is equal to

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97. If $I_n = \int_0^{n\pi} \max(|\sin x|, |\sin^{-1}(\sin x)|) dx$, the $I_2 + I_4$ has the value $\frac{\lambda\pi^2}{2}$, where λ is

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98. If $x \in [0, 2\pi]$ then the number of solution of the equation $81^{\sin^2 x} + 81^{\cos^2 x} = 30$



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99. If $f(x) = \begin{cases} \frac{\sin 2x}{cx} + \frac{x}{(\sqrt{x+a^2}-a)} & x \neq 0, (a < 0) \\ b & x = 0, (b \neq 0) \end{cases}$

and $f(x)$ is continuous at $x = 0$, then the value of bc is equal to



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100. A harbour lies in a direction 60° south - west from a fort and at a distance 30 km from it .A ship sets from the harbour at noon and sails due east at 10 km / hour .The ship will be 70 km from the fort at



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101. If $u = x^2 + y^2$ and $x = s + 3t, y = 2s - t$, then $\frac{d^2u}{ds^2}$ is equal to

A. 12

B. 32

C. 36

D. 10

Answer: D



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102. If N is the number of positive integral solutions of the equation $x_1x_2x_3x_4 = 770$, then the value of N is

A. 250

B. 252

C. 254

Answer: D



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103. If one root of the equation $x^2 + px + q = 0$ is the square of the other then

A. $p^3 + q^2 - q(3p + 1) = 0$

B. $p^3 + q^2 + q(1 + 3p) = 0$

C. $p^3 + q^2 + q(3p - 1) = 0$

D. $p^3 + q^2 + q(1 - 3p) = 0$

Answer: D



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104. If $s_n = \sum_{r=0}^n \frac{1}{{}^n C_r}$ and $t_n = \sum_{r=0}^n \frac{r}{{}^n C_r}$, then $\frac{t_n}{s_n}$ is equal to

A. $n - 1$

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

C. $\frac{1}{2}n$

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

Answer: C



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105. $\lim_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \ln(1 - x)}{x \cdot \tan^2 x}$

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

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

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

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

Answer: A



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106. The range of value of α such that $(0, \alpha)$ lies on or inside the triangle formed by the lines $y + 3x + 2 = 0$, $3y - 2x - 5 = 0$, $4y + x - 14 = 0$ is

A. $0 < \alpha < \frac{5}{2}$

B. $0 < \beta < \frac{7}{2}$

C. $\frac{5}{3} \leq \beta \leq \frac{7}{2}$

D. None of these

Answer: C



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107. The value of $\int_0^\pi (\sum_{r=0}^3 a_r \cos^{3-r} x \sin^r x) dx$ depends upon

A. a_1 and a_2

B. a_0 and a_3

C. a_2 and a_3

D. a_1 and a_3

Answer: D

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108. Solve the equation: $\tan^{-1} \sqrt{x^2 + x} + \sin^{-1} \sqrt{x^2 + x + 1} = \frac{\pi}{2}$

A. $-1, 0$

B. $0, 1$

C. $-1, 1$

D. $-1, 2$

Answer: A

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109. The sum of $0.2 + 0.22 + 0.222 + \dots$ to n terms is equal to

- A. $\left(\frac{2}{9}\right) - \left(\frac{2}{81}\right)(1 - 10^{-n})$
- B. $n\left(\frac{1}{9}\right)(1 - 10^{-n})$
- C. $\left(\frac{2}{9}\right)\left[n - \left(\frac{1}{9}\right)(1 - 10^{-n})\right]$
- D. $\left(\frac{2}{9}\right)$

Answer: C



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110. If tangent at $(1, 2)$ to the circle $C_1: x^2 + y^2 = 5$ intersects the circle $C_2: x^2 + y^2 = 9$ at A and B and tangents at A and B to the second circle meet at point C, then the co-ordinates of C are given by

- A. $(4, -5)$
- B. $\left(\frac{3}{5}, \frac{6}{5}\right)$

C. $(4, 5)$

D. $\left(\frac{9}{5}, \frac{18}{5}\right)$

Answer: D

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111. The minimum distance of a point on the curve $y = x^2 - 4$ from origin

,

A. $\frac{\sqrt{15}}{2}$ units

B. $\sqrt{\frac{19}{2}}$ units

C. $\sqrt{\frac{15}{2}}$ units

D. $\frac{\sqrt{19}}{2}$ units

Answer: A

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112. The domain of the function $f(x) = \sqrt{\ln(|x|-1)(x^2 + 4x + 4)}$ is

- A. $[-3, -1] \cup [1, 2]$
- B. $(-2, -1) \cup [2, \infty)$
- C. $(-\infty, -3] \cup (-2, -1) \cup (2, \infty)$
- D. $[-2, -1] \cup [2, \infty)$

Answer: C



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113. The expression $(1 + \tan x + \tan^2 x)(1 - \cot x + \cot^2 x)$ has the positive values for x , given by

- A. $\left[0, \frac{\pi}{2}\right]$
- B. $[0, \pi]$
- C. $R - \left\{x = \frac{n\pi}{2}, n \in I\right\}$
- D. $[0, \infty]$

Answer: C



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114. the value of θ for which the system of equations

$$(\sin 3\theta)x - 2y + 3z = 0, (\cos 2\theta)x + 8y - 7z = 0$$

and $2x + 14y - 11z = 0$ has a non-trivial solution, is (here, $n \in \mathbb{Z}$)

A. $n\pi$

B. $n\pi + (-1)^n \pi / 3$

C. $n\pi + (-1)^n \pi / 2$

D. None of these

Answer: A



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115. If both the mean and the standard deviation of 50 observations x_1, x_2, \dots, x_{50} are equal to 16, then the mean of $(x_1 - 4)^2, (x_2 - 4)^2, \dots, (x_{50} - 4)^2$ is

A. 525

B. 480

C. 400

D. 380

Answer: C



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116. For an initial screening of an admission test, a candidate is given fifty problems to solve. If the probability that the candidate can solve any problem is $\frac{4}{5}$, then the probability that he is unable to solve less than two problems is

A. $\frac{201}{5} \left(\frac{1}{5}\right)^{49}$

B. $\frac{164}{25} \left(\frac{1}{5}\right)^{48}$

C. $\frac{316}{25} \left(\frac{4}{5}\right)^{48}$

D. $\frac{54}{5} \left(\frac{4}{5}\right)^{49}$

Answer: D



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117. Let S be the set of all real numbers. Then the relation $R =$

$\{(a, b) : 1 + ab > 0\}$ on S is

A. reflexive and symmetric but not transitive

B. reflexive and transitive but not symmetric

C. reflexive, transitive and symmetric

D. None of the above

Answer: A



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118. The contrapositive of $(p \vee q) \rightarrow r$ is

A. $r \Rightarrow (p \vee q)$

B. $\sim r \Rightarrow (p \vee q)$

C. $\sim r \Rightarrow \sim p \wedge \sim q$

D. $r \Rightarrow (q \vee r)$

Answer: C



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119. $\left(1 + \cos. \frac{\pi}{8}\right) \left(1 + \cos. \frac{3\pi}{8}\right) \left(1 + \cos. \frac{5\pi}{8}\right) \left(1 + \cos. \frac{7\pi}{8}\right)$ is equal to

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

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

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: C

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120. The area of the closed region bounded by $y = \sec^{-1} x$, $y = \operatorname{cosec}^{-1} x$ and the line $x - 1 = 0$ is

A. $\left\{ \log_e (3 + 2\sqrt{2}) - \frac{\pi}{2} \right\}$ sq. units

B. $\left\{ \frac{\pi}{2} - \log_e (3 + 2\sqrt{2}) \right\}$ sq. units

C. $\pi - 3 \log_e 3$ sq. units

D. None of these

Answer: A

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121. Tangents are drawn from the point $(\alpha, 2)$ to the hyperbola $3x^2 - 2y^2 = 6$ and are inclined at angles θ and ϕ to the x-axis . If $\tan \theta, \tan \phi = 2$, then the value of $2\alpha^2 - 7$ is



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122. Let $f: R \rightarrow R$ be a differentiable function with $f(0) = 1$ and satisfying the equation $f(x + y) = f(x)f'(y) + f'(x)f(y)$ for all $x, y \in R$. Then, the value of $(\log)_e(f(4))$ is _____



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123. Let $\vec{a}, \vec{b}, \vec{c}$ be three non-zero non coplanar vectors and \vec{p}, \vec{q} and \vec{r} be three vectors given by $\vec{p} = \vec{a} + \vec{b} - 2\vec{c}, \vec{q} = 3\vec{a} - 2\vec{b} + \vec{c}$ and $\vec{r} = \vec{a} - 4\vec{b} + 2\vec{c}$

If the volume of the parallelopiped determined by \vec{a}, \vec{b} and \vec{c} is V_1 and that of the parallelopiped determined by \vec{a}, \vec{q} and \vec{r} is V_2 , then $V_2:V_1 =$

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124. If a complex number z lie on a circle of radius $\frac{1}{2}$ units, then the complex number $\omega = -1 + 4z$ will always lie on a circle of radius k units, where k is equal to

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125. $\int [\sin(101x) \cdot \sin^{99} x] dx$

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Math

1. The solution of $dy = \cos x (2 - y \operatorname{cosec} x) dx$, where $y = \sqrt{2}$, when $x = \pi/4$ is

A. $y = \sin x + \frac{1}{2} \operatorname{cosec} x$

B. $y = \tan(x/2) + \cot(x/2)$

C. $y = (1/\sqrt{2})\sec(x/2) + \sqrt{2}\cos(x/2)$

D. None of the above

Answer: A



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2. Find the domain of the function f given by $f(x) = \frac{1}{\sqrt{[x]^2 - [x] - 6}}$

A. $(-\infty, -2)$

B. $(-\infty, -2) \cup [4, \infty)$

C. $[4, \infty)$

D. $(-\infty, -2] \cup [4, \infty)$

Answer: B



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3. The area of the region (in square units) above the x - axis bounded by the curve $y = \tan x$, $0 \leq x \leq \frac{\pi}{2}$ and the tangent to the curve at $x = \frac{\pi}{4}$ is

A. $\frac{1}{2} \left(\log 2 - \frac{1}{2} \right)$

B. $\frac{1}{2} (1 + \log 2)$

C. $\frac{1}{2} (1 - \log 2)$

D. $\frac{1}{2} \left(\log 2 + \frac{1}{2} \right)$

Answer: A



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4. Two men are on the opposite sides of a tower. They measure the angles of elevation of the top of the tower as 45° and 30° respectively. If the height of the tower is 40 m, then the distance between the men is

A. 40 m

B. $40\sqrt{3}m$

C. 68.28 m

D. 109.28 m

Answer: D



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5. Let C_1, C_2, C_3, \dots are the usual binomial coefficients where $C_r = {}^n C_r$.

Let $S = C_1 + 2C_2 + 3C_3 + \dots + nC_n$, then S is equal to

A. $n2^n$

B. 2^{n-1}

C. $n2^{n-1}$

D. 2^{n+1}

Answer: C



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6. If $p = \sin^2 x + \cos^4 x$, then

A. $\frac{3}{4} \leq p \leq 1$

B. $\frac{3}{16} \leq p \leq \frac{1}{4}$

C. $\frac{1}{4} \leq p \leq \frac{1}{2}$

D. None of these

Answer: A



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7. If $p \Rightarrow (q \vee r)$ is false, then the truth values of p, q, r are respectively

A. T, F, F

B. F, T, T

C. F, F, F

D. T, T, F

Answer: A



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8. A box contains tickets numbered 1 to N . n tickets are drawn from the box with replacement. The probability that the largest number on the tickets is k , is

A. $\left(\frac{k}{N}\right)^n$

B. $\left(\frac{k-1}{N}\right)^n$

C. 0

D. None of these

Answer: D



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9. The coordinates of the focus of the parabola described parametrically by $x = 5t^2 + 2$, $y = 10t + 4$ are

A. (7, 4)

B. (3, 4)

C. (3, - 4)

D. (- 7, 4)

Answer: A



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10. The rate of change of $\sqrt{x^2 + 16}$ with respect to $\frac{x}{x - 1}$ at $x = 3$ is

A. 2

B. $\frac{11}{5}$

C. $-\frac{12}{5}$

D. - 3

Answer: C



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11. If $\left| \frac{z - i}{z + 2i} \right| = 1$, $|z| = \frac{5}{2}$ then the value of $|z + 3i|$

A. $\sqrt{10}$

B. $\frac{7}{2}$

C. $\frac{15}{4}$

D. $2\sqrt{3}$

Answer: B



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12. Let a, b, c are respectively the sums of the first n terms, the next n terms and the next n terms of a GP. Show that a, b, c are in GP.

A. arithmetic progression

B. geometric progression

C. harmonic progression

D. none of these

Answer: B



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13. The function $f(x) = \{x\}\sin(\pi[x])$, where $[.]$ denotes the greatest integer function and $\{.\}$ is the fractional part function, is discontinuous at

A. all x

B. all integer points

C. no x

D. x which is not an integer

Answer: C



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14. There are number of seats and m number of people have to be seated, then how many ways are possible to do this ($m < n$)?

A. ${}^n P_m$

B. ${}^n C_m$

C. ${}^n C_n \times (m - 1)!$

D. ${}^{n-1} P_{m-1}$

Answer: A



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15. Let $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $J = \int_0^1 \frac{\cos x}{\sqrt{x}} dx$. Then which one of the following is true?

A. $I > \frac{2}{3}$ and $J < 2$

B. $I > \frac{2}{3}$ and $J > 2$

C. $I < \frac{2}{3}$ and $J < 2$

D. $I > \frac{2}{3}$ and $J > 2$

Answer: C



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16. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a + \lambda)^2 & (b + \lambda)^2 & (c + \lambda)^2 \\ (a - \lambda)^2 & (b - \lambda)^2 & (c - \lambda)^2 \end{vmatrix} = k\lambda \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix} \lambda \neq 0$ then k is

equal to :

A. $4\lambda abc$

B. $-4\lambda^2$

C. $4\lambda^2$

D. $-4\lambda abc$

Answer: C



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17. Coefficient of variation of two distributions are 60% and 75%, and their standard deviations are 18 and 15 respectively. Find their arithmetic means.

A. 30, 30

B. 30, 20

C. 20, 30

D. 20, 20

Answer: B

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18. $\{x \in R : \cos 2x + 2 \cos^2 x = 2\}$ is equal to

A. $\left\{2n\pi + \frac{\pi}{3} : n \in Z\right\}$

B. $\left\{ n\pi \pm \frac{\pi}{6} : n \in \mathbb{Z} \right\}$

C. $\left\{ n\pi + \frac{\pi}{3} : n \in \mathbb{Z} \right\}$

D. $\left\{ 2n\pi - \frac{\pi}{3} : n \in \mathbb{Z} \right\}$

Answer: B



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19. $\lim_{x \rightarrow 0} \frac{\ln(1+x)}{x^2} + \frac{x-1}{x} =$

A. ∞

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

C. $-\frac{1}{2}$

D. 1

Answer: B



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20. The abscissa of the points, where the tangent to curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to X-axis are

A. $x = 0$

B. $x = 1$ and -1

C. $x = 1$ and -3

D. $x = -1$ and 3

Answer: D



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21. The value of $x, \forall x \in R$ which satisfy the equation $(x - 1)|x^2 - 4x + 3| + 2x^2 + 3x - 5 = 0$ is



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22. Let $f(x) = \frac{9x}{25} + c, c > 0$. If the curve $y = f^{-1}(x)$ passes through $\left(\frac{1}{4}, -\frac{5}{4}\right)$ and $g(x)$ is the antiderivative of $f^{-1}(x)$ such that $g(0) = \frac{5}{2}$, then the value of $[g(1)]$ is, (where $[.]$ represents the greatest integer function)

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23. Let $x + \frac{1}{x} = 2, y + \frac{1}{y} = -2$ and $\sin^{-1} x + \cos^{-1} y = m\pi$, then the value of m is

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24. If
 $\hat{i} \times [(\vec{a} - \hat{j}) \times \hat{i}] + \hat{j} \times [(\vec{a} - \hat{k}) \times \hat{j}] + \hat{k} \times [(\vec{a} - \hat{i}) \times \hat{k}] = 0$
and $\vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$, then find the value of $8(x^3 - xy + zx)$

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25. A circle touches the hypotenuse of a right angled triangle at its middle point and passes through the middle point of shorter side. If 3 unit and 4 unit be the length of the sides and 'r' be the radius of the circle, then find the value of $3r$

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26. if $\sum_{r=0}^{25} {}^{50}C_r ({}^{50-r}C_{25-r}) = k ({}^{50}C_{25})$, then k equals:

A. 2^{25}

B. $2^{25} - 1$

C. 2^{24}

D. $(25)^2$

Answer: A

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27. If $1, \log_3 \sqrt{3^{1-x} + 2}, \log_3(4 \cdot 3^x - 1)$ are in AP then x equals

A. $\log_3 4$

B. $1 - \log_3 4$

C. $1 - \log_4 3$

D. $\log_4 3$

Answer: B



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28. The area (in square units) enclosed by $|y| - x^2 = 1$ and $x^2 + y^2 = 1$

is

A. 2

B. zero

C. infinite

D. None of these

Answer: B



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29. A computer producing factory has only two plants T_1 and T_2 . Plant T_1 produces 20% and plant T_2 produces 80% of the total computers produced. 7% of computers produced in the factory turn out to be defective. It is known that $P(\text{computer turns out to be defective, given that it is produced in plant } T_1) = 10P(\text{computer turns out to be defective, given that it is produced in plant } T_2)$, where $P(E)$ denotes the probability of an event E . A computer produced in the factory is randomly selected and it does not turn out to be defective. Then, the probability that it is produced in plant T_2 , is

A. $\frac{36}{73}$

B. $\frac{47}{79}$

C. $\frac{78}{93}$

D. $\frac{75}{83}$

Answer: C



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30. Set of values of b for which local extrema of the function $f(x)$ are positive where $f(x) = \frac{2}{3}a^2x^3 - \frac{5a}{2}x^2 + 3x + b$ and maximum occurs at $x = \frac{1}{3}$ is -

A. $-(4, \infty)$

B. $\left(-\frac{3}{8}, \infty\right)$

C. $\left(-10, \frac{3}{8}\right)$

D. None of these

Answer: B



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31. If p and q are two statements, then $p \vee \sim(p \Rightarrow \sim q)$ is equivalent to

A. $p \wedge q$

B. P

C. q

D. $\sim p \wedge q$

Answer: B



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32. The coordinates of the orthocenter of the triangle that has the coordinates of midpoint of its sides as $(0,0)$, $(1,2)$ and $(-6,3)$ is

A. $(0,0)$

B. $(-4,5)$

C. $(-5,5)$

D. $(-4,4)$

Answer: C

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33. On differentiating $\tan^{-1} \left[\frac{\sqrt{1+x^2}-1}{x} \right]$ with respect to x , the result would be

A. $\frac{1}{2} \cdot \frac{1}{1+x^2}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{1}{2} \cdot \frac{1}{1+2x}$

Answer: A

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34. Sum of the squares of all integral values of a for which the inequality $x^2 + ax + a^2 + 6a < 0$ is satisfied for all $x \in (1, 2)$ must be equal to

A. 90

B. 89

C. 88

D. 91

Answer: D



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35. If $f: (0, \infty) \rightarrow (0, \infty)$ and $f(x) = \frac{x}{1+x}$, then f is

A. one-one and onto

B. one-one but not onto

C. onto but not one-one

D. neither one-one nor onto

Answer: B



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36. The mean and standard deviation of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and standard deviation?

- A. 4
- B. 6
- C. 3
- D. 5

Answer: D



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37.
$$\sum_{k=1}^{10} \left(\frac{\sin(2k\pi)}{11} + i \frac{\cos(2k\pi)}{11} \right)$$

- A. 1
- B. -1

C. i

D. $-i$

Answer: C

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38. The value of $\lim_{n \rightarrow \infty} \sum_{r=1}^{r=4n} \frac{\sqrt{n}}{\sqrt{r}(3\sqrt{r} + 4)\sqrt{n^2}}$ is equal to

A. $\frac{1}{8}$

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

C. $\frac{1}{6}$

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

Answer: B

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39. The angle of elevation of a cloud from a point 250 m above a lake is 15° and angle of depression of its reflection in lake is 45° . The height of the cloud is

A. $250\sqrt{3}m$

B. 250 m

C. $\frac{250}{\sqrt{3}}m$

D. None of these

Answer: A



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40. Let P be the relation defined on the set of all real number such that

$P = [(a, b) : \sec^2 a - \tan^2 b = 1]$. Then P is:

A. reflexive and symmetric but not transitive

B. symmetric and transitive but not reflexive

C. reflexive and transitive but not symmetric

D. an equivalence relation

Answer: D



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41. The general solution of the differential equation

$$\left[2\sqrt{xy} - x\right]dy + ydx = 0 \text{ is (Here } x, y > 0 \text{)}$$

A. $\log x + \sqrt{\frac{y}{x}} = c$

B. $\log y - \sqrt{\frac{x}{y}} = c$

C. $\log y + \sqrt{\frac{x}{y}} = c$

D. None of these

Answer: C



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42. Let $f: (-1, 1) \rightarrow \mathbb{R}$ be a function defined by $f(x) = \max\{-|x|, -\sqrt{1-x^2}\}$. If K is the set of all points at which f is not differentiable, then K has set of all points at which f is not differentiable, then K has exactly

- A. two elements
- B. one element
- C. three elements
- D. five elements

Answer: C

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43. The value of $2 \sin^2 \theta + 4 \cos(\theta + \alpha) \sin \alpha \sin \theta + \cos 2(\alpha + \theta)$

- A. $\cos \theta + \cos \alpha$
- B. independent of θ

C. independent of α

D. independent of both θ and α

Answer: B



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44. If $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix}$, $B = \text{adj } A$ and $C = 3A$ then $\frac{|\text{adj } B|}{|C|}$ is equal to

A. 8

B. 16

C. 72

D. 2

Answer: A



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45. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\left[1 - \tan\left(\frac{x}{2}\right)\right][1 - \sin x]}{\left[1 + \tan\left(\frac{x}{2}\right)\right][\pi - 2x]^3}$

A. $\frac{1}{8}$

B. 0

C. $\frac{1}{32}$

D. ∞

Answer: C



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46. From the string abacabababcdced, if 5 letters should be selected , then the number of ways in which this selection can be done is

A. 51

B. 91

C. 71

Answer: C

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47. Let \vec{a} and \vec{b} be two unit vectors such that $\vec{a} \cdot \vec{b} = 0$. For some $x, y \in \mathbb{R}$, let $\vec{c} = x\vec{a} + y\vec{b} + (\vec{a} \times \vec{b})$. If $|\vec{c}| = 2$ and the vector \vec{c} is inclined at same angle α to both \vec{a} and \vec{b} then the value of $8 \cos^2 \alpha$ is

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48. Number of solution of $2^{\sin(|x|)} = 3^{|\cos x|}$ in $[-\pi, \pi]$, is equal to

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49. The point, which is at the shortest distance from the line $x + y = 7$ and lying on an ellipse $x^2 + 2y^2 = 6$, has coordinates (a, b) then the value of $\frac{a}{b}$ is

- A.
- B.
- C.
- D.

Answer: 2



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50.

If

$$y = \tan^{-1}\left(\frac{1}{x^2 + x + 1}\right) + \tan^{-1}\left(\frac{1}{x^2 + 3x + 3}\right) + \tan^{-1}\left(\frac{1}{x^2 + 5x + 7}\right)$$

and $\left(\frac{dy}{dx}\right)_{x=0} = \frac{-k}{1+k}$ then the value of k is



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1. $f(x) = \max \left\{ \frac{x}{n}, |\sin \pi x| \right\}, n \in \mathbb{N}$. has maximum points of non-differentiability for $x \in (0, 4)$, Then n cannot be (A) 4 (B) 2 (C) 5 (D) 6

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2. The value of the expression

$$\frac{2(\sin 1^\circ + \sin 2^\circ + \sin 3^\circ + \dots + \sin 89^\circ)}{2(\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 44^\circ) + 1}$$
 is equal to

- A. $\sqrt{2}$
 B. $\frac{1}{\sqrt{2}}$
 C. $\frac{1}{2}$
 D. 0

Answer: A

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3. The sum of all real values of x satisfying the equation

$$(x^2 - 5x + 5)^{x^2 + 4x - 60} = 1 \text{ is:}$$

A. 6

B. 5

C. 3

D. -4

Answer: C



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4. If $C_0, C_1, C_2, \dots, C_n$ are binomial coefficients, (where $C_r = {}^n C_r$),

then the value of $C_0 - C_1 + C_2 - C_3 + \dots + (-1)^n C_n$ is equal to

A. 2^{n-1}

B. 2^n

C. 0

D. 1

Answer: C



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5. If $f(x) = \cos x \cos 2x \cos 4x \cos(8x) \dots \cos 16x$ then find $f'\left(\frac{\pi}{4}\right)$

A. $\sqrt{2}$

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

C. 1

D. none of these

Answer: A



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6. $(p \rightarrow q) \wedge (q \rightarrow \neg p)$ is equivalent to

A. p

B. q

C. $\sim p$

D. $\sim q$

Answer: C



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7. z is a complex number such that $|Re(z)| + |Im(z)| = 4$ then $|z|$ can't be

A. $\sqrt{\frac{17}{2}}$

B. $\sqrt{10}$

C. $\sqrt{7}$

D. $\sqrt{8}$

Answer: C

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8. $\int \frac{\ln\left(\frac{x-1}{x+1}\right)}{x^2-1} dx$ is equal to

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

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

C. $\frac{1}{4} \left(\ln\left(\frac{x-1}{x+1}\right) \right)^2 + C$

D. $\frac{1}{4} \left(\ln\left(\frac{x+1}{x-1}\right) \right)^2 + C$

Answer: C

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9. A circle of radius 2 units is touching both the axes and a circle with centre at (6,5). The distance between their centres is

A. 8 units

B. 5 units

C. 7 units

D. none of these

Answer: B



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10. The value of the expression $\cot^{-1}\left(\frac{1}{2}\right) + \cot^{-1}\left(\frac{9}{2}\right) + \cot^{-1}\left(\frac{25}{2}\right) + \cot^{-1}\left(\frac{49}{2}\right)$ upto +n terms is

A. $\tan^{-1} 2n$

B. $\tan^{-1}(2n - 1)$

C. $\tan^{-1} n$

D. $\tan^{-1} 2n - \tan^{-1} 1$

Answer: A

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11. If $\begin{vmatrix} x - 4 & 2x & 2x \\ 2x & x - 4 & 2x \\ 2x & 2x & x - 4 \end{vmatrix} = (A + Bx)(x - A)^2$ then the ordered pair (A,B) is equal to

- A. (4, 5)
- B. (-4, -5)
- C. (-4, 3)
- D. (-4, 5)

Answer: D

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12. A rectangle with sides of lengths $(2n - 1)$ and $(2m - 1)$ units is divided into squares of unit length. The number of rectangles which can be formed with sides of odd length, is

A. m^2n^2

B. $mn(m + 1)(n + 1)$

C. $4(m + n) - 1$

D. none of these

Answer: A

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13. For a group of 50 male workers, the mean and the standard deviation of their daily wages are Rs. 630 and Rs. 90 respectively and for a group of 40 female workers these are Rs. 540, and Rs . 60 respectively. Then, the standard deviation of all these 90 workers is

A. 60

B. 70

C. 80

D. 90

Answer: D



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14. If $\lim_{x \rightarrow 0} \frac{\{(a - n)nx - \tan x\} \sin nx}{x^2} = 0$, where n is non-zero real number, then a is equal to

A. 0

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

C. n

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

Answer: D



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15. Find the point at which the slope of the tangent of the function

$f(x) = e^x \cos x$ attains minima, when $x \in [0, 2\pi]$.

A. $x = \pi$

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

C. $x = \frac{3\pi}{4}$

D. $x = \frac{3\pi}{2}$

Answer: A



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16. There are 5 machines. Probability of a machine being faulted is $\frac{1}{4}$. Probability of atmost two machines is faulted, is $\left(\frac{3}{4}\right)^3 k$, then value of k is

A. $\frac{17}{8}$

B. $\frac{17}{4}$

C. $\frac{17}{2}$

D. 4

Answer: A



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17. The point of intersection of the lines

$$\vec{r} = 7\hat{i} + 10\hat{j} + 13\hat{k} + s(2\hat{i} + 3\hat{j} + 4\hat{k}) \quad \text{and}$$

$$\vec{r} = 3\hat{i} + 5\hat{j} + 7\hat{k} + t(\hat{i} + 2\hat{j} + 3\hat{k}) \text{ is}$$

A. $\hat{i} + \hat{j} - \hat{k}$

B. $2\hat{i} - \hat{j} + 4\hat{k}$

C. $\hat{i} - \hat{j} + \hat{k}$

D. $\hat{i} + \hat{j} + \hat{k}$

Answer: D



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18. The solution of the differential equation

$$\frac{dy}{dx} + x(2x + y) = x^3(2x + y)^3 - 2 \text{ is (C being an arbitrary constant)}$$

A. $\frac{1}{2x + xy} = x^2 + 1 + Ce^x$

B. $\frac{1}{(2x + y)^2} = x^2 + 1 + Ce^{x^2}$

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

D. $\frac{1}{(2x + y)^2} = x^2 + 1 + Ce$

Answer: B



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19. If \vec{a} , \vec{b} , \vec{c} are mutually perpendicular vectors having magnitudes

1,2,3 respectively, then $\left[\vec{a} + \vec{b} + \vec{c} \quad \vec{b} - \vec{a} \quad \vec{c} \right] =$

A. 0

B. 6

C. 12

D. 18

Answer: C



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20. The length of the chord of the parabola $x^2 = 4y$ having equations

$$x - \sqrt{2}y + 4\sqrt{2} = 0 \text{ is}$$

A. $6\sqrt{3}$ units

B. $8\sqrt{2}$ units

C. $2\sqrt{11}$ units

D. $3\sqrt{2}$ units

Answer: A



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1. The area bounded by the curves $y=\ln x$, $y=\ln|x|$, $y=|\ln x|$ and $y=|\ln||x|$ is

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2. The number of elements in the set $\{(a, b) : a^2 + b^2 = 50, a, b \in Z\}$ where Z is the set of all integers, is

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3. The value of the integral $\int_0^{\frac{1}{2}} \frac{1 + \sqrt{3}}{\left((x+1)^2(1-x)^6\right)^{\frac{1}{4}}} dx$ is _____.

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4. If $\sum_{k=1}^{\infty} \frac{1}{(k+2)\sqrt{k} + k\sqrt{k+2}} = \frac{\sqrt{a} + \sqrt{b}}{\sqrt{c}}$, where $a, b, c \in N$ and $a, b, c \in [1, 15]$, then $a + b + c$ is equal to

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5. Consider the equation

$\log_{\sqrt{2}\sin x}(1 + \cos x) = 2, x \in \left[-\frac{\pi}{2}, \frac{3\pi}{2} \right]$. If the sum of the roots is $\frac{p\pi}{q}$, where G.C.D (p,q) = 1 then the value of $p^2 + q^2$ is



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Mcqs Math

1. If x, y and z are in AP and $\tan^{-1} x, \tan^{-1} y$ and $\tan^{-1} z$ are also in AP, then

A. $x=y=z$

B. $x=y=-z$

C. $x=1, y=2, z=3$

D. $x=2, y=4, z=6$

Answer: A



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2. If $\vec{r} \cdot \hat{i} = 2\vec{r} \cdot \hat{j} = 4\hat{r} \cdot \hat{k}$ and $|\vec{r}| = \sqrt{84}$, then the value of $\vec{r} \cdot (2\hat{i} - 3\hat{j} + \hat{k})$ may be



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3. If $A = \{x \in R: |x| < 2\}$ and $B = \{x \in R: |x - 2| \geq 3\}$, then

A. $A \cap B = (-2, -1)$

B. $B - A = R - (-2, 5)$

C. $A \cup B = R - (2, 5)$

D. $A - B = [-1, 2)$

Answer: B



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4. On which of the following intervals is the function $x^{100} + \sin x - 1$ decreasing?

A. $\left(0, \frac{\pi}{2}\right)$

B. $(0, 1)$

C. $\left(\frac{\pi}{2}, \pi\right)$

D. none of these

Answer: D



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5. The area bounded by the graph $y=[x-3]$, the X-axis and the lines $x=-2$ and $x=3$ is ([.] denotes the greatest integer function)

A. 7 sq. units

B. 15 sq. units

C. 21 sq. units

D. 28 sq. units

Answer: B



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6. $\lim_{n \rightarrow \infty} \frac{3 \cdot 2^{n+1} - 4 \cdot 5^{n+1}}{5 \cdot 2^n + 7 \cdot 5^n} =$

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

B. $-\frac{4}{7}$

C. $-\frac{20}{7}$

D. 0

Answer: C



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7. Let function F be defined as $f(x) = \int_1^x \frac{e^t}{t} dt$ where $x > 0$ then the value of the integral $\int_1^{1+a} \frac{e^t}{t+a} dt$ where $a > 0$ is

- A. $e^a[F(x) - F(1+a)]$
- B. $e^{-a}[F(x+a) - F(a)]$
- C. $e^a[F(x+a) - F(1+a)]$
- D. $e^{-a}[F(x+a) - F(1+a)]$

Answer: D



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8. The sum of the squares of deviation of 10 observations from their mean 50 is 250, then coefficient of variation is

- A. 25
- B. 50
- C. 10

D. 5

Answer: C



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9. 2.The number of ordered pair(s) (x,y) satisfying $y = 2 \sin x$ and $y = 5x^2 + 2x + 3$ is equal to-

A. 0

B. 1

C. 2

D. infinite

Answer: A



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10. If $g(x) = x^2 + x + x - 1$ and $g(f(x)) = 4x^2 - 10x + 5$ then find $f\left(\frac{5}{4}\right)$

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

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

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

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

Answer: B



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11. The tangents to $x^2 + y^2 = a^2$ having inclinations α and β intersect at P . If $\cot \alpha \cot \beta = 0$, then find the locus of P .

A. $x + y = 0$

B. $x - y = 0$

C. $xy = 0$

D. none of these

Answer: C



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12. Which of the following is logically equivalent to $\sim(\sim p \rightarrow q)$?

A. $p \wedge q$

B. $q \wedge \sim q$

C. $\sim p \wedge q$

D. $\sim p \wedge \sim q$

Answer: D



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13. The number of different terms in the expansion of $(1 - x)^{201}(1 + x + x^2)^{200}$ is

A. 200

B. 201

C. 202

D. 402

Answer: D



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14. The angle of elevation of an object on a hill is observed from a certain point in the horizontal plane through its base, to be 30° . After walking 120 m towards it on a level ground, the angle of elevation is found to be 60° . Then the height of the object (in metres) is

A. 120

B. $60\sqrt{3}$

C. $120\sqrt{3}$

D. 60

Answer: B



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15. If α, β are the roots of the equation $x^2 - 3x + 4 = 0$, then the equation whose roots are $\frac{\alpha - 2}{\alpha + 2}, \frac{\beta - 2}{\beta + 2}$ is

A. $7x^2 - 1 = 0$

B. $7x^2 + 1 = 0$

C. $7x^2 + 2 = 0$

D. $7x^2 - 2 = 0$

Answer: B



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16. If $y = A \cos(\log x) + B \sin(\log x)$ then prove that

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0.$$

A. y

B. $-y$

C. $2y$

D. $-2y$

Answer: B



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17. If z be a complex number satisfying $|z - 4 + 8i| = 4$, then the least and the greatest value of $|z + 2|$ are respectively (where $i = \sqrt{-1}$)

A. 7 and 16

B. 8 and 17

C. 6 and 14

D. 5 and 13

Answer: C



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18. A perpendicular is drawn from a point on the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1}$ to the plane $x + y + z = 3$ such that plane $x - y + z = 3$. Then, the coordinates of Q are

A. (2,0,1)

B. (-1,0,4)

C. (4,0,-1)

D. (1,0,2)

Answer: A



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19. The general solution of the differential equation

$$\frac{dy}{dx} + \frac{\sin(x+y)}{2} = \frac{\sin(x-y)}{2} \text{ is}$$

- A. $\ln \tan \left(\frac{y}{2} \right) = c - 2 \sin x$
- B. $\ln \tan \left(\frac{y}{4} \right) = c - 2 \sin \left(\frac{x}{2} \right)$
- C. $\ln \tan \left(\frac{y}{2} + \frac{\pi}{4} \right) = c - 2 \sin x$
- D. $\ln \tan \left(\frac{y}{4} + \frac{\pi}{4} \right) = c - 2 \sin \left(\frac{x}{2} \right)$

Answer: B



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20. The number of value of $x \in [0, 2]$ at which

$$f(x) = \left| x - \frac{1}{2} \right| + |x - 1| + \tan x \text{ is not differentiable at}$$



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21. Find the number of ways in which four distinct balls can be kept into two identical boxes so that no box remains empty.

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22. A bag contains b blue balls and r red balls. If two balls are drawn at random, the probability drawing two red balls is five times the probability of drawing two blue balls. Furthermore, the probability of drawing one ball of each color is six times the probability of drawing two blue balls.

Then

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23. If the maximum and minimum values of the determinant

$$\begin{vmatrix} 1 + \sin^2 x & \cos^2 x & \sin 2x \\ \sin^2 x & 1 + \cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1 + \sin 2x \end{vmatrix}$$
 are α and β respectively, then

$\alpha + 2\beta$ is equal to

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24. The equation of the common tangent to the curves

$y^2 = 4x$ and $x^2 + 32y = 0$ is $x + by + c = 0$. the value of

$|\sin^{-1}(\sin 1) + \sin^{-1}(\sin b) + \sin^{-1}(\sin c)|$ is equal to



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25. $I = \int \frac{dx}{\sqrt[4]{(x-1)^3(x+2)^5}} = k^4 \sqrt{\frac{x-1}{x+2}} + C$, then 'k' is equal to:

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

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

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

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

Answer: D



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