



MATHS

BOOKS - JMD MATHS (PUNJABI ENGLISH)

Solved Sample Question Papers

Example

1. The range of function $f(x) = \frac{|x - 1|}{x - 1}$

A. 1

B. $R - \{0\}$

C. -1

D. $[-1,1]$

Answer: D

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2. The value of $\cos\left(\tan^{-1}\left(\frac{3}{4}\right)\right)$ is:

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

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

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

D. None of these

Answer: A

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3. If $A + B = C$, where A and B are matrices of order 2×3 , then order of C is :

A. 3×2

B. 2×3

C. 2×2

D. 3×3

Answer: B



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4. If $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} x & 3 \\ 2x & 5 \end{bmatrix}$, then $x =$

A. 3

B. 4

C. 2

D. None of these

Answer: C



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5. The derivative of $\sin x^2$ w. r. t. x^2 is

A. $\cos x^2$

B. $2x \cos x^2$

C. $\sin 2 \frac{x}{2}$

D. $\frac{\cos x^5}{2} x^2$

Answer: A



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6. If $f(x) = \begin{cases} 2x + 3 & x \leq 1 \\ k & x > 1 \end{cases}$ is continuous at $x = 1$

then $k =$

A. 2

B. 5

C. 3

D. 1

Answer: B



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7. $\frac{d}{dx} [\sin^{-1}(\cos x)] =$

A. $-\sin x$

B. -1

C. x

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

Answer: B



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8. The value of $\int \frac{\sec^2 x}{\cos e c^2 x} dx$ is

A. $\left(\frac{\tan x}{\cot x}\right) + c$

B. $\sec^2 x / (\operatorname{cosec}^2 x) + c$

C. $\tan x - x + c$

D. None of these

Answer: C



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9. $\int e^{(\log x)}/x \, dx =$

A. $\log x + c$

B. $e^{\log x} + c$

C. $x \log x + c$

D. $x e^{\log x} + c$

Answer: B

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10. The degree of the differential equation

$$\frac{d^2 y}{dx^2} + \left[1 + \left(\frac{dy}{dx} \right)^2 \right]^{\frac{3}{2}} = 0 \text{ is}$$

A. 1

B. 2

C. 3

D. None of these

Answer: B



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11. The angle between the vectors $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\hat{b} = 3\hat{i} - 2\hat{j} - \hat{k}$ is :

A. $\cos^{-1} (2/7)$

B. $\cos^{-1} \left(\frac{5}{7} \right)$

C. $\cos^{-1} (6/7)$

D. None of these

Answer: A



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12. Find $|\vec{x}|$, if for a unit vector \vec{e}_a , $(\vec{e}_x - \vec{e}_a) \cdot (\vec{e}_x + \vec{e}_a) = 8$

A. 3

B. 9

C. 2

D. $\sqrt{3}$

Answer: A

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13. Distance of the point $(2, 5, -3)$ from the plane $\vec{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4$ is

A. 4

B. 44381

C. 44390

D. None of these

Answer: C



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14. The d.r. of line parallel to $x - \frac{3}{1} = y - \frac{4}{2} = 3 - \frac{x}{2}$ are

A. $\langle 1, 2, 2 \rangle$

B. $\langle 1, -2, 2 \rangle$

C. $\langle 1, 2, -2 \rangle$

D. $\langle 1, -2, -2 \rangle$

Answer: B



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15. Solution set of inequality $x \geq 0$ is

A. half plne on the left of Y-axis

B. half plane on the right of Y-axis excluding y-axis

C. half plane on the right of Y-axis including the points
on Y-axis

D. None og these

Answer: C

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16. In a family, with two children, the probability of both children are girls is:

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

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

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

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

Answer: B

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17. The number of relations set from $[A = 1, 2, 3]$ to $B = [1, 3]$ is

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18. The possible order of a matrix having 4 elements are

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19.
$$\begin{bmatrix} (\log_a^b) & 1 \\ 1 & \log_b^a \end{bmatrix} = \dots$$

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20. $\frac{d}{dx}(\log_a x) = \dots\dots\dots$

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21. $f(x) = \cos x$ is strictly increasing in $(\pi, 2\pi)$

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22. $\int \tan^2 x dx = \dots\dots\dots$

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23. The degree of diff. equation $\frac{d^3y}{dx^3} + \left(\frac{dx}{dy}\right) + e^2 = 0$ is

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24. If $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$ then

$$P\left(\frac{E}{F}\right) = \dots\dots\dots .$$

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25. State whether it is true or false: $\sin^{-1}(\sin x) = x$,

$$x \in \left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$$

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26. State whether it is true or false: If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then

$$2A = \begin{bmatrix} 6 & -8 \\ 2 & -8 \end{bmatrix}$$

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27. State whether it is true or false:

$$\frac{d}{dx}(\cos^{-1} x) = \frac{-1}{\sqrt{1-x^2}}$$

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28. State whether it is true or false:

$$\int \frac{a^x}{b^x} dx = \frac{a^x}{b^x(\log a - \log b)} + c$$

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29. State whether it is true or false: $y = ax$ is a solution of

$$xy + y = 0$$

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30. State whether it is true or false: If $\left| \vec{a} \cdot \vec{b} \right| = \left| \vec{a} \times \vec{b} \right|$

then the angle between vec a and vec b is $\pi/6$

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31. State whether it is true or false: If a line makes angles alpha, beta, gamma which positive direction of axes then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = 1$.

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32. State whether it is true or false: If A and B are dependent events then $P \cap B = P(A) \cdot (B)$

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33. Show that the points $(a + 5, a + 4)$, $(a - 2, a + 3)$ and (a, a) do not lie on a straight line for any value of a .

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34. If $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that $f(x) \cdot f(y) = f(x + y)$

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35. The slope of the curve $2y^2 - ax^2 = b$ at $(1,-1)$ is -1 find a and b .

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36. integrate $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx$

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37. solve 'int_0^(π/4) sqrt(1+sin2x) dx'

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38. find the area of the region bounded by 'y²=4x' and x=2

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39. Find λ so that the scalar projection of

$$\vec{a} = \lambda\hat{i} + \hat{j} + 4\hat{k} \text{ on } \vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k} \text{ is 4 units}$$

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40. Find unit vector in the direction of $\vec{a} + \vec{b}$, where

$$\vec{a} = -\hat{i} + \hat{j} + \hat{k} \text{ and } \vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$$

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41. Prove that :

$$\tan^{-1} \left[\frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right] = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x^2$$

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42. If $x^y + y^x = (x + y)^{x+y}$, then prove that

$$\frac{dy}{dx} = \frac{(x + y)^{x+y}[1 + \log(x + y)] - yx^{y-1} - y^x \log y}{x^y \log x + xy^{x-1} - (x + y)^{x+y}[1 + \log(x + y)]}$$

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43. If $y = \left[\log \left(x + \sqrt{x^2 + 1} \right) \right]^2$ then show that

$$(x^2 + 1)y_2 + xy_1 = 0$$

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44. Evaluate $\int \frac{dx}{\sin x - \sin 2x}$

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45. Solve $(3xy + y^2)dx + (x^2 + xy)dy = 0, y(1) = 1$

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46. solve the differential equation: $\frac{dy}{dx} = \tan(x + y)$

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47. A car manufacturing factory has to plant s X and Y. Plant X manufactures 70% of the cars plant Y manufactures 30%. 80% of the cars at plant X and 90% of the cars at plant Y are rated of standard quality. A car is chosen at random and is found to be of standard quality what is the probability that it comes from plant X

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48. Solve the following system of linear equations by matrix method: $x - y + z = 4$, $2x + y - 3z = 0$, $x + y + z = 2$

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49. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then verify $A^{-1}A = I$

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50. Find the shortest distance (S.D.) between the lines :

$$\vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k}) \quad \text{and}$$

$$\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k}).$$



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51. Find the equation of the perpendicular drawn from the

point $(2,4,-1)$ to the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$



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52. Maximise $z = 20x + 15y$ subject to constraints

$$120x + 60y \leq 12000, x + y \leq 150$$



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53. Maximise $z = x + y$ subject to $2x + y \leq 50,$

$$x + 2y = 40$$

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54. The number of bijective functions from A to B if

$$n(A) = n(B) = 4$$

A. 81

B. 64

C. 16

D. 24

Answer: d

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55. The value of $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$ is:

A. $4/5$

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

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

D. None of these

Answer: a



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56. If $AB = A$ and $BA=B$, then $B^2=$

A. B

B. A

C. I

D. 0

Answer: C

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57. If A is a square matrix of order 3 such that $|A| = 13$, then $|adjA|$ is equal to

A. 39

B. 196

C. 169

D. 190

Answer: C

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58. If $f(x) = \begin{cases} 1 - kx & x \leq 3 \\ 2x + 3 & x > 3 \end{cases}$ is a continuous function, then the value of k is

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

B. $-\frac{8}{3}$

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

D. None of these

Answer: B



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59. If $f(x) = \begin{cases} \frac{\tan 3x}{x} & x \neq 0 \\ 4k & x = 0 \end{cases}$ is continuous at $x=0$ then $k=$

A. 3

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

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

D. 12

Answer: B

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60. $\frac{d}{dx} \{ \tan^{-1} \sqrt{x} \} =$

A. $1/(2\sqrt{x(1+x)})$

B. $1/(1+x)$

C. $1/(2(\sqrt{x}+x))$

D. $(1)/(2x(x+1))$

Answer: A

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61. The value of $\int \frac{dx}{16x^2 - 25}$ is

A. $\frac{1}{20} \log \left| \frac{4x - 5}{4x + 5} \right| + C$

B. $\frac{1}{30} \log \left| \frac{4x - 5}{4x + 5} \right| + C$

C. $\frac{1}{40} \log \left| \frac{4x - 5}{4x + 5} \right| + C$

D. None of these

Answer: C



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62. $\int e^x (\cos x - \sin x) dx =$

A. $-e^x \cos + C$

B. $e^x \sin x + C$

C. $-e^x \cos + C$

D. $e^x \cos x + C$

Answer: D



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63. the differential equation of order 3 and degree 2 is

A. $\left(\frac{d^2y}{dx^2}\right)^3 + 3y = 0$

B. $\left(\frac{d^3y}{dx^3}\right)^2 + y = 0$

C. $\left(\frac{d^3y}{dx^3}\right)^2 + y^2 = 0$

D. $\frac{d^2y}{dx^2} + 3y^3 = 0$

Answer: B



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64. If $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{k}$ then $\text{veca} \cdot \text{vecb}$ is

A. 3

B. -3

C. 4

D. None of these

Answer: B



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65. for what value of lambda, the vectors $\vec{a} = 3\hat{i} - \hat{j} + 4\hat{k}$,
 $b = \lambda\hat{i} + 3\hat{j} + 3\hat{k}$ are perpendicular to each other

A. 3

B. -3

C. 0

D. 0.05

Answer: B



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66. The direction ratios of a line normal to the plane

$$x + 2y - 3z + 4 = 0 \text{ are}$$

A. 1,-2,3

B. 1,-2,-3

C. 1,2,-3

D. None of these

Answer: C



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67. The d.r of the line $\frac{4-x}{2} = \frac{3-y}{5} = \frac{z+1}{6}$ are

A. $\langle 2, 5, 6 \rangle$

B. $\langle 2, 5, 6 \rangle$

C. $\langle 2, -5, 6 \rangle$

D. $\langle 2, 5, -6 \rangle$

Answer: C

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68. The Solution set of the inequation $x + 2y > 3$ is

A. upper plane containing the origin

B. upper half plane not containing the origin

C. first quadrant

D. none of this

Answer: B



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69. From a bag containing 4 red and 2 white balls two balls are drawn. The probability that both the balls are red is:

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

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

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

D. None of these

Answer: B

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70. If xRy for a symmetric relation then it is necessary that

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71. For $[a_{ij}]_{m \times n}$ is a square matrix if -----

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72. $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & 5 \\ 8 & 3 \end{vmatrix}$, then $x =$ -----



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73. $\frac{d}{dx} (e^{e^x}) = \text{-----}$

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74. $f(x) = x^3 - 12x$ is strictly decreasing in _____

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75. $\int \frac{dx}{\sin^2 x \cos^2 x}$ equals :

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76. Order of $\left(\frac{dy}{dx}\right)^2 + \frac{1}{\frac{dy}{dx}} = 3$ is _____

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77. Two events A and B are independent if $P(A \cap B) =$

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78. State wheter is true or false:

$$\sec^{-1}(\sec x) = x, x \in [0, \pi] - \left[\frac{\pi}{2}\right]$$

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79. If A is 3×4 matrix and B is 4×3 matrix, then the order of AB is

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80. State whether is true or false:

$$\frac{d}{dx} \left\{ e^{f(x)} \right\} = e^{f(x)} \frac{d}{dx} (f(x))$$

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81. State whether is true or false: $\int \frac{\sin^2 x}{1 + \cos x} dx = x - \sin x + C$

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82. State whether is true or false: $y^2 = 4ax$ is a solution of

$$2xy_1 = y$$

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83. State whether is true or false: If \vec{a}, \vec{b} be two vectors

then $\left| \vec{a} + \vec{b} \right|$ is $\left| \vec{a} \right| + \left| \vec{b} \right|$

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84. State whether is true or false: The direction cosines of the

line joining $(1, 0, 0)$ and $(0, 1, 1)$ is $\langle -1, 1, 1 \rangle$

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85. State whether is true or false : If E and F are mutually exclusive events then $P(E \cup F) = P(E) + P(F)$

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86. If $A = \begin{bmatrix} k & 0 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find k of $A^2 = B$

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87. If $A = \begin{bmatrix} 3 & 2 & -3 \\ 2 & -1 & 1 \\ 4 & 3 & 2 \end{bmatrix}$ then find $A(\text{adj}A)$

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88. Find a point on the curve $y = (x - 2)^2$ at which the tangent is parallel to the chord joining the points (2,0) and (4,4)

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89. Integrate $\int \frac{\cos x - \cos 2x}{1 - \cos x} dx$

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90. Evaluate: $\int_0^1 \frac{\tan^{-1} x}{1 + x^2} dx$

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91. Find the area of the region bounded by the curve

$$y^2 = 4x, y\text{-axis and } y = 3$$

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92. If \vec{a} and \vec{b} are unit vectors inclined at an angle

$$\theta \text{ then prove that } \cos\left(\frac{\theta}{2}\right) = \frac{1}{2} \left| \vec{a} + \vec{b} \right|$$

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93. Find the area of parallelogram whose diagonals are

$$2\hat{i} + 3\hat{j} + 6\hat{k} \text{ and } 3\hat{i} - 6\hat{j} + 2\hat{k}$$

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94. Solve the Equation :

$$\tan^{-1}\left(\frac{x-1}{x+2}\right) + \tan^{-1}\left(\frac{2x-1}{2x+1}\right) = \frac{\tan^{-1} 23}{36}$$

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95. Differentiate $\tan^{-1}\left(\frac{x}{1+\sqrt{1-x^2}}\right)$ with respect to

$$\sin\left[(2 \cot^{-1})\sqrt{\frac{1+x}{1-x}}\right]$$

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96. If $x = a(\cos 2\theta + 2\theta \sin 2\theta)$ and $y = a(\sin 2\theta - 2\theta \cos 2\theta)$, then find the value of $\frac{d^2x}{d^2y}$ at

$$\theta = \frac{\pi}{4}$$

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97. Evaluate $\int \frac{x^2}{x^4 + x^2 - 2} dx$

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98. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{x \sin x}{1 + e^x} dx$

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99. Solve the differential equation:

$$x \sin\left(\frac{y}{x}\right) \frac{dy}{dx} + x - y \sin\left(\frac{y}{x}\right) = 0, y(1) = \frac{\pi}{2}$$

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100. Solve the differential equation :

$$(2x - 2y + 5)dy = (x - y + 3)dx$$



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101. Give three identical boxes I , II and III, each containing two coins. In box I both coins are gold coins, in box II both are silver coins and in box III there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold ?



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102. Solve by matrix method $x - y + 2z = 7$

$$3x + 4y - 5z = -5 \quad 2x - y + 3z = 12$$

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103. If $A = \begin{bmatrix} -1 & 2 & 0 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, show that $A^3 = I$, Also Find A^{-1}

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104. Find the shortest distance between the lines

$$\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - 3\hat{j} + 2\hat{k}) \quad \text{and}$$

$$\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \lambda(2\hat{i} + 3\hat{j} + \hat{k})$$

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105. Find image of point (1,6,3) on the line

$$\frac{x}{1} = \frac{y - 1}{2} = \frac{z - 2}{3}$$



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106. Maximise $z = 1000x + 500y$ Subject to constraints

$$3x + 5y \leq 225, 2x + y \leq 80$$



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107. Select the Correct Option $a * b = a + 2b^2$ then $3 * 2$

A. 11

B. 14

C. 15

D. 8

Answer: A



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108. Select the Correct Option If value of $\cos(\sec^{-1}\{5/3\})$ is:

A. $(5/3)$

B. $(3/5)$

C. $(4/5)$

D. $(5/4)$

Answer: B

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109. Select the Correct Option If A is any matrix of order 2×3 and B is any matrix of order 3×4 in order of $(AB)'$ is

A. 4×2

B. 2×4

C. 2×3

D. 3×2

Answer: A

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110. Select the Correct Option If A is an invertible matrix of order 2, then $\det(A^{-1})$ is equal to

A. 0

B. $\det A$

C. 1

D. $1/\det A$

Answer: D



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111. Select the Correct Option If $3axy = c$, then $dy/dx =$

A. $-x/y$

B. $-y/x$

C. 0

D. $c/(3a)$

Answer: B



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112. Select the Correct Option

$f(x) = \begin{cases} \frac{\sin kx}{2x} & x \neq 0 \\ 3 & (x = 0) \end{cases}$ is continuous then

$k+2=$

A. 6

B. 8

C. $(3/2)$

D. 4

Answer: B



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113. Select the Correct Option $d/dx \{\log(\log x)\} =$

A. $1/\log x$

B. $1/(x \log x)$

C. $1/x$

D. $x \log x$

Answer: D



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114. Select the Correct Option The value of $\int \frac{dx}{1-9x^2}$ is

A. $\frac{1}{6} \log \left| \frac{1+3x}{1-3x} \right| + C$

B. $\frac{1}{3} \log \left| \frac{1+3x}{1-3x} \right| + C$

C. $\frac{1}{9} \log \left| \frac{1+3x}{1-3x} \right| + C$

D. None of these

Answer: A

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115. $\int \frac{dx}{\sqrt{1-x^2}}$ is equal to :

A. $\log|x+\sqrt{1-x^2}|+C$

B. $\sin^{-1}x + C$

C. $\tan^{-1}x + C$

D. $\cos^{-1}x + C$

Answer: B



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116. The order and degree of the differential equation

$$\left(\frac{dy}{dx}\right)^4 + 3y\frac{d^2y}{dx^2} = 0 \text{ are}$$

A. order 1, degree 2

B. order 2, degree 1

C. order 2, degree 4

D. order 4, degree 2

Answer: B

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117. The projection of vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on $vacb = \hat{i} + 2\hat{j} + \hat{k}$ is :

A. $\sqrt{5}/6$

B. $2/3\sqrt{6}$

C. $\sqrt{3}/2$

D. $5/3\sqrt{6}$

Answer: D





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118. For what value of λ , the vectors $(\lambda - 2)\vec{a} + \vec{b}$ and $(4\lambda - 2)\vec{a} + 3\vec{b}$ are collinear

A. 2

B. 2, -4

C. 4

D. -4

Answer: D



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119. The direction-cosines of the line joining (2, -4, 5) and (0, -6, 4) are

A. 2, 2, 1

B. (-2, -2, -1)

C. $\frac{2}{3}, \frac{2}{3}, \frac{1}{3}$

D. None of these

Answer: C

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120. Distance of the point (2,5,-3) from the plane

$$\vec{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4 \text{ is}$$

A. $(13/7)$

B. $(12/7)$

C. $(15/7)$

D. $(11/7)$

Answer: A



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121. Any point in half plane $2x + 3y - 12 \geq 0$ is

A. $(0,-12)$

B. $(12,0)$

C. $(4,0)$

D. (0,-4)

Answer: B



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122. In tossing of a pair of dice, the probability of getting an odd number greater than 2 on each die is :

A. $(1/3)$

B. $(1/9)$

C. $(1/6)$

D. $(1/4)$

Answer: B



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123. Fill in the Blanks Let $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by

$$f(x) = \frac{1}{2 + \cos x} \quad x \in \mathbb{R} \text{ then range of } f \text{ is } \dots$$

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124. Fill in the Blanks If $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$

then $2A+B=$

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125. $\frac{d}{dx} [\sin^{-1}(\cos x)] =$

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126. Fill in the Blanks $f(x) = x^3 - 3x^2 + 3x$ is strictly increasing in

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127. Fill in the Blanks $\int \sec^2(4x - 5) dx = \dots\dots$

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128. Fill in the Blanks The degree of diff. equation

$$\left(\frac{d^2y}{dx^2}\right)^2 + \frac{dy}{dx} = \sin\left(\frac{dy}{dx}\right) \text{ is } \dots\dots$$

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129. Fill in the Blanks If $P(A) = \frac{1}{5}$, $P(B) = \frac{3}{10}$,
 $P(A \cap B) = \frac{3}{25}$ then $P(A \cup B)$ is ...

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130. State whether it is true or false Domain of $\sin^{-1}x$ is $[-\pi/2, \pi/2]$

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131. State whether it is true or false If A is a singular matrix
then $|A| = 0$.

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132. State whether it is true or false

$$\frac{d}{dx}\{(\log_a f(x))\} = \left(\frac{1}{f'(x)}\right) \frac{d}{dx}\{f(x)\}$$

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133. State whether it is true or false $\int_2^3 \frac{dx}{x^2 - 1} = \log\left(\frac{4}{3}\right)$

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134. State whether it is true or false $y = \tan^{-1} x + C$ is a solution of $(x^2 + 1) \frac{dy}{dx} = 1$.

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135. State whether it is true or false If \vec{a} , \vec{b} are two vectors

$$\text{then } \left| \vec{a} \cdot \vec{b} \right| \leq \left| \vec{a} \right| \left| \vec{b} \right|$$

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136. State whether it is true or false The equation of line passing through $(1, -1, 4)$ and parallel to $(2\hat{i} + \hat{j} - 3\hat{k})$

$$\text{is } \frac{x - 2}{1} = \frac{y - 1}{-1} = \frac{z + 3}{4}$$

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137. State whether it is true or false If $P(A) = 0$,

$$P(B) = \frac{2}{3} \text{ then } P\left(\frac{A}{B}\right) = 0$$

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138. For any 2×2 matrix, if $A \cdot (\text{adj}A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$ then find $|A|$.

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139. If $A = \begin{bmatrix} 3 & -3 \\ -3 & 3 \end{bmatrix}$ and $A^2 = \lambda A$ then find lambda.

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140. Find a point on the curve $y = (x - 2)^2$ at which the tangent is parallel to the chord joining the points (2,0) and (4,4)

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141. Integrate $\int \tan^{-1} \left(\frac{\sin 2x}{1 + \cos 2x} \right) dx$

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142. Find the area of region bounded by curve $x^2 = y$ and $y = 4$.

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143. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} - \hat{k}$ then show that $(\vec{a} \times \vec{b}) \cdot \vec{c} = \vec{a} \cdot (\vec{b} \times \vec{c})$

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144. If \vec{a} and \vec{b} are perpendicular vectors,

$$|\vec{a} + \vec{b}| = 13, |\vec{a}| = 5 \text{ then find } |\vec{b}|.$$

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145. Solve : $\cot^{-1}(2x) + \cot^{-1}(3x) = \frac{\pi}{4}$

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146. If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, then prove that

$$\frac{dy}{dx} = -\sqrt{\frac{1-y^2}{1-x^2}}$$

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147. If $y = \sin(m \sin^{-1} x)$, prove that

$$(1 - x^2)y_2 - xy_1 + m^2y = 0$$

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148. Evaluate: $\int e^x \left(\frac{\sin 4x - 4}{1 - \cos 4x} \right) dx.$

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149. Prove that: $\int_0^\pi \frac{x \tan x}{\sec x \cos ecx} dx = \frac{\pi^2}{4}.$

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150. Solve $x \cos\left(\frac{y}{x}\right) dy = \left\{ y \cos\left(\frac{y}{x}\right) + x \right\} dx$



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151. Find the solution of the differential equation

$$(x + y + 1)^2 dy = dx.$$



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152. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually six.



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153. Solve by matrix method $2x + 3y + 3z = 5$

$$x - 2y + z = -4 \quad 3x - y - 2z = 3$$

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154. If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}, B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$ then verify

$$(AB)^{-1} = B^{-1}A^{-1}.$$

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155. Find shortest distance between lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$

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156. Find image of the point $(1,0,3)$ to the line joining points $(4,7,1)$ and $(3,5,3)$.

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157. Maximise $z = 102x + 135y$ subject to $x + y \leq 300$,
 $2x + 3y \leq 720$, $x, y, \geq 0$

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158. if $a \cdot b = 2a^2 + ab$ then $2 \cdot 5 =$

A. 19

B. 24

C. 15

D. 18

Answer: D



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159. the principal value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is

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

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

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

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

Answer: B



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160. If $\begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 11 \end{bmatrix}$, then write the correct answer from the following :

A. 2

B. 5

C. 3

D. 8

Answer: D



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161. Let A be a non-singular square matrix of order 3×3 . Then $\text{abs}(\text{adj}A)$ is

A. $\text{abs}(A)^3$

B. $\text{abs}(A)$

C. $3\text{abs}(A)$

D. $\text{abs}(A)^2$

Answer: D

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162. if $y = \sec(\tan^{-1}x)$, then $(dy)/dx$ is equal to

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

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

C. $\frac{1}{s} \arcsin(1+x^2)$

D. $\frac{x}{\sqrt{1+x^2}}$

Answer: D



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163. $f(x) = \begin{cases} \frac{x^2-4}{x-2} & x \neq 2 \\ 2k & x = 2 \end{cases}$ is continuous at $x=2$ then $k=$

A. 4

B. 5

C. 6

D. 2

Answer: D



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164. $\frac{d}{dx}(\log \tan x) =$

A. $2 \sin 2x$

B. $2 \cos ecx$

C. $2 \cos ec2x$

D. $2 \sin x$

Answer: C



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165. the value of $\int \frac{dx}{x^2 - a^2}$ is:

A. $\log|x^2 - a^2| + c$

B. $\frac{1}{2a} \log|(x - a) - (x + a)| + c$

C. $2 \frac{x}{(x^2 - a^2)^3}$

D. $\log\left|\frac{x - a}{x + a}\right| + c$

Answer: B

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166. the value of $\int \frac{\log x}{x} dx =$

A. $\log x + C$

B. $\int \frac{\log x^2}{x} + C$

C. $2 \log x + C$

D. $\frac{1}{x} + C$

Answer: B



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167. the order and degree of the differential equation

$$\frac{d^2y}{dx^2} + \frac{\left(\frac{dy}{dx}\right)^1}{3} + x = 0 \text{ are respectively}$$

A. 2, 3

B. 3, 3

C. 2, 2

D. 2, 4

Answer: A



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168. if $|\vec{a}| = 3$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 3$, then angle between veca and vecb is:

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

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

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

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

Answer: B



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169. the angle between vectors $\vec{a} \times \vec{b}$ and $\vec{b} \times \vec{a}$ is

A. 180°

B. 90°

C. 0°

D. 45°

Answer: A

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170. the direction cosines of a line equally inclined to the coordinate axes are:

A. 1, 1, 1

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

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

D. $\pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}$

Answer: D



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171. the distance between $2x + 3y + 4 = 0$ and $4x + 6y - 12 = 0$ is

A. $\frac{2}{\sqrt{21}}$

B. $\frac{3}{\sqrt{21}}$

C. $\frac{2}{\sqrt{29}}$

D. $\frac{4}{\sqrt{29}}$

Answer: C



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172. the point lies in half plane $x - 2y < 0$ as

A. (5,2)

B. (3,1)

C. (4,1)

D. (-1,0)

Answer: D



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173. from a bag containing 4 red and 2 black balls, two balls are drawn. the probability of getting two black balls is:

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

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

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

D. $\frac{1}{15}$

Answer: D

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174. Fill in the blanks: the Identity elements of $a \cdot b = a + b - 4$, for $ab \in z$ is _____.

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175. fill the blanks: if P is a matrix of order 2×4 and Q is of 4×3 then order of (PQ)' is _____.

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176. fill in the banks: if $|A| = 4$ then $\text{abs}(3A) = \text{_____}$ where A is a of order 3×3 .

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177. $\frac{d}{dx} \{ \sin^{-1} x^2 \} = \text{_____}$.

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178. filling the blanks: the slope of normal to the curve

$x^2 + y^2 = 25$ at $(-3,4)$ is _____.

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179. fill in the blanks: $\int \frac{dx}{\sqrt{5x+3}} =$ _____.

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180. Fill in the blanks: the differentiate equation of

$y = c. \sin x$ is _____.

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181. Fill in the blanks: if A and B are mutually exclusive events such as that $P(A) = \frac{1}{2}$, $P(B) = p$ and $P(A \cup B) = \frac{3}{4}$ then p is _____.

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182. state whether it is true or false: Domain of $\tan^{-1} x$ is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

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183. State whether it is true or false: every square Matrix can be represented as sum of symmetry and skew symmetric matrix.

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184. State whether it is true or false:

$$\frac{d}{dx} \{ \sin^{-1}(f(x)) \} = \frac{1}{\sqrt{1 - (f(x))^2}}$$

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185. $\int_1^{\sqrt{3}} \frac{dx}{1+x^2}$ equals :

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186. state whether it is true or false: the differential

equation of all lines in a plane is $\frac{d^2y}{dx^2} = 0$

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187. state whether it is true or false: projection of a vector \vec{a} on vector \vec{b} is $\vec{a} \cdot \vec{b}$

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188. state whether it is true or false: the point of the line $\frac{2x - 1}{3} = \frac{4 - y}{1} = \frac{3z + 6}{6}$ from which line passes is $(1/2, 4, -2)$.

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189. state whether it is true or false: If A and B are any two events then $P\left(\frac{A}{B}\right)P(B) = P(A \cap B)$.



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190. for the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find x and y such that $A^2 + xA + yI = 0$.



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191. if area of triangle is 35sq. unit with vertices $(2, -6)$, $(5, 4)$ and $(K, 4)$ find K .



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192. find the interval in which $f(x) = \cos\left(2x + \frac{\pi}{4}\right)$ is strictly increasing.

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193. if $f'(x) = 3x^2 - \frac{2}{x^3}$ and $f(1) = 0$, find $f(x)$.

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194. find the region bounded by line $2y = -x + 8$ and axes.

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195. find angles between veca and vecb with magnitudes 1 and 2 and when $\left| \vec{a} \times \vec{b} \right| = \sqrt{3}$.

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196. find a vector of magnitude 6, which is perpendicular to

$4\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ and $-2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$.

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197.

Prove

that

$$\sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right) + \sin^{-1}\left(\frac{16}{65}\right) = \frac{\pi}{2}.$$

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198. If $\sin y = x \sin(a + y)$, prove that $\frac{dy}{dx} = \frac{\sin^2(a + y)}{\sin a}$

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199.

If

$$y = \log(x + \sqrt{x^2 + 1}), \text{ prove that } (x^2 + 1)d^2 \frac{y}{dx^2} + x \frac{dy}{dx} = 0$$

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200. Evaluate: $\int e^{-\frac{x}{2}} \frac{\sqrt{1 - \sin x}}{1 + \cos x} dx$

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201. Evaluate $\int_{\pi/6}^{\pi/3} \left(\frac{1}{1 + \sqrt{\tan x}} \right) dx$

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202. Solve the following differential equation :

$$(1 + x^2) \frac{dy}{dx} + y = \tan^{-1} x$$

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203. Show that the differential equation :

$2ye^{\frac{x}{y}} dx + \left(y - 2xe^{\frac{x}{y}} \right) dy = 0$ is homogeneous and find its particular solution given that $x = 0$ when $y = 1$

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204. A girl throws a die. If she gets 5 or 6, tosses a coin three times and notes the number of heads. If she gets 1,2,3 or 4, she tosses a coin two times and notes the number of

heads. If she obtained exactly two heads, what is the probability that she throws 1,2,3 or 4 with the die.

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205. Solve by matrix method. $\frac{1}{x} + \frac{2}{y} - \frac{3}{z} = -4$
 $\frac{2}{x} + \frac{3}{y} + \frac{2}{z} = 2$ $\frac{3}{x} - \frac{1}{y} - \frac{4}{z} = 11$

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206. If $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$, show that $A^2 - 6A + 17I = 0$,

Hence find A^{-1}

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207. Find the vector equation of the plane passing through the points $(2,5,-3)$, $(-2,-3,5)$ and $(5,3,-3)$.

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208. Find the equation of the plane which contain the line of intersection of the plane $\vec{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) - 4 = 0$ and $\vec{r} \cdot (2\hat{i} + \hat{j} - \hat{k}) + 5 = 0$ and which is perpendicular to the plane $5x + 3y - 6z + 8 = 0$.

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209. Maximize $z = 11x + 3y$ subject to
 $2x + y \leq 6, x \leq 2, x, y > 0$.



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210. If $a*b = \text{LCM of } (a,b)$ then $4*6$

A. 24

B. 12

C. 8

D. 6

Answer: B



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211. Range of $\tan^{-1}x =$

A. $[-\pi/2, \pi/2]$

B. $[0, \pi]$

C. $(-\pi/2, \pi/2)$

D. $(0, \pi)$

Answer: C



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212. Let A, B be matrices of order 3×3 such that $A' = -A$ and $B' = B$ then matrix $\lambda AB + 3BA$ is skew symmetric if $\lambda =$

A. 3

B. -3

C. 3, -3

D. None

Answer: A



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213. If A is any square matrix of order 3×3 such that $|A| = 3$, then the value of $|adj A|$

A. 3

B. $(1/3)$

C. 9

D. 27

Answer: C





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214. The derivative of $\log x$ w.r.t. x^2 is

A. $1/(2x^2)$

B. $x/2$

C. $x^2/2$

D. $1/(2x)$

Answer: A



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215. Find a if $f(x) = \begin{cases} \frac{\sqrt{5x+2} - \sqrt{4x+4}}{x-2} & x \neq 2 \\ a & x = 2 \end{cases}$ is

continuous as $x=2$

A. $1/(2\sqrt{3})$

B. $1/\sqrt{3}$

C. $2/\sqrt{3}$

D. $1/(4\sqrt{3})$

Answer: D



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216. $\frac{d}{dx} \{|4x - 3|\} =$

A. $4/\text{abs}(4x-3)$

B. $(4(4x-3))/\text{abs}(4x-3)$

C. $(4x-3)/\text{abs}(4x-3)$

D. $1/\text{abs}(4x-3)$

Answer: B

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217. $\int \frac{dx}{\sqrt{9 - 25x^2}}$

A. $\sin^{-1}\left(\frac{5x}{3}\right) + c$

B. $\frac{1}{5}\sin^{-1}\left(\frac{5x}{3}\right) + c$

C. $\frac{1}{6}\sin^{-1}\left(\frac{3 + 5x}{3 - 5x}\right) + c$

D. $\frac{1}{30}\log\left(\frac{3 + 5x}{3 - 5x}\right) + c$

Answer: B

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218. $\int \frac{e^{2 \sin^{-1} x}}{\sqrt{1-x^2}} = dx =$

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

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

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

D. $2e^{2 \sin^{-1} x} + c$

Answer: A



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219. The number of arbitrary constants in the particular solution of a diff. equation of order 2 in 2.

A. 2

B. 3

C. 1

D. 0

Answer: D

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220. Find λ and μ if :

$$(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + \lambda\hat{j} + \mu\hat{k}) = \vec{0}.$$

A. $p=6, q=27$

B. $p=3, q=(27/2)$

C. $p=6, q=(27/2)$

D. $p=3, q=27$

Answer: B



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221. Find lambda so that the scalar projection of

$\vec{a} = \lambda\hat{i} + \hat{j} + 4\hat{k}$ on $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$ is 4units

A. 5

B. 4

C. 3

D. 6

Answer: A





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222. What is the distance (in units) between the two planes

$$3x + 5y + 7z = 3 \text{ and } 9x + 15y + 21z = 9:$$

A. 0

B. 3

C. $6/\sqrt{83}$

D. 6

Answer: A



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223. If $\cos \alpha$, $\cos \beta$, $\cos \gamma$ are the direction-cosines of a line, then the value of $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma =$

A. 1

B. 0

C. -1

D. 2

Answer: D



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224. Any point in half plane $2x + 3y - 12 \geq 0$ is

A. (1,2)

B. (2,1)

C. (2,3)

D. (-3,2)

Answer: C



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225. An urn contains 6 balls of which two are red and four are black. Two balls are drawn at random. Probability that they are of the different colours is :

A. $(2/5)$

B. $(1/15)$

C. $(8/15)$

D. (4/15)

Answer: C

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226. Fill in the Blanks : Every identity element is an

.....

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227. Fill in the Blanks : If $A = \begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ is skew

symmetric matrix then $x + 2 = \dots\dots\dots$

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228. If area of triangle is 35 sq. units with vertices (2,-6), (5, 4) and (k,4) then k is :

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229. The second order derivative of $\frac{1}{x}$ is _____

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230. If the tangent is parallel to x axis then slope = _____

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231. $\int \frac{\sec^2(3 \tan^{-1} x)}{1 + x^2} dx = \underline{\hspace{2cm}}$

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232. The diff. equation of $y = kx^2$ is $\underline{\hspace{2cm}}$

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233. A fair dice is rolled. The events are $E = \{1,2,3\}$ $F = \{3,5\}$, then $P(E/F)$ is $\underline{\hspace{2cm}}$

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234. State whether it is true or false: $\cos^{-1}\left(-\frac{1}{2}\right) = -\frac{\pi}{3}$



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235. State whether it is true or false: If $|A| = 9$ then

$$|A^{-1}| = \frac{1}{9}$$

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236. State whether it is true or false: The second order

derivative of $\log x$ is $-\frac{1}{x^2}$

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237. State whether it is true or false: $\int \frac{dx}{9x^2 + 4} =$

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

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238. State whether it is true or false: The no. of arbitrary constants in the general solution of a differential equation of order 3 is 3.



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239. State whether it is true or false: If two vector \vec{a} and \vec{b} are perpendicular to each other then $\vec{a} \cdot \vec{b} = 0$.



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240. State whether it is true or false: The angle between diagonals of a cube is $\cos^{-1}\left(\frac{1}{3}\right)$.



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241. State whether it is true or false: If A and B are independent events then $P(A \cap B) = P(A) + P(B)$.



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242. If $A = \begin{bmatrix} 2 & -3 \\ 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$, then $AB \neq BA$.



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243. If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 6 \\ 1 & -2 \end{bmatrix}$, then verify $|AB| = |A| |B|$.



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244. Find the intervals in which $f(x) = 2x^3 + 9x^2 + 12x + 20$ is increasing or decreasing.

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245. Solve $\int \frac{dx}{x^2 + 6x + 13}$.

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246. Evaluate: $\int \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$.

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247. Find the area enclosed by the circle $x^2 + y^2 = 1$.



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248. If $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}|=3, |\vec{b}|=5, |\vec{c}|=7$, then find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.



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249. Find the area of triangle with vertices $(1,1,2), (2,3,5), (1,5,5)$.



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250. If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, then prove that

$$\frac{dy}{dx} = -\sqrt{\frac{1-y^2}{1-x^2}}$$



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251. If $x = a(\cos 2\theta + 2\theta \sin 2\theta)$ and $y = a(\sin 2\theta - 2\theta \cos 2\theta)$, find $\left(d^2 \frac{y}{dx^2}\right)$ at $\theta = \frac{\pi}{8}$



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252. Solve the differential equation $xdy - ydx = \sqrt{x^2 + y^2}dx$



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253. Evaluate $\int_1^3 |x^2 - 2x| dx$



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254. There are three coins, one is a two-headed coin (having head on both the faces), another is a biased coin that comes up heads 75% of the time and the third is an unbiased coin. One of the three coins is chosen at random and tossed. If it shows head, what is the probability that it was the two-headed coin?

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255. Find $\int (\sin^{-1} x)^2 dx$

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256. Solve the following system of linear equations by matrix method :

$$3x - 2y + 3z = 8, 2x + y - z = 1, 4x - 3y + 2z = 4$$

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257. Given $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$, find $(A)^{-1}$.

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258. Find equation of a plane passing through the points $(2, 1, 0)$, $(3, -2, -2)$ and $(3, 1, 7)$

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259. Find the shortest distance between the lines.

$$\frac{x - 8}{3} = \frac{y + 9}{-16} = \frac{z - 10}{7} \text{ and } \frac{x - 15}{3} = \frac{y - 29}{8} = \frac{z - 5}{-5}.$$

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260. Maximise $z = 10x + 6y$, Subject to $3x + y \leq 12$,

$$3x + 5y \leq 34, x, y > 0.$$

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