Bihar Board Class 12 Maths Elective Set J 2025 Question Paper with Solutions

Time Allowed :3 Hours 15 Minutes	Maximum Marks :70	Total Questions :96

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours 15 Minutes duration.
2. The question paper consists of 96 questions.
3. In Section - B, there are 20 short answer type questions, each carrying 2 marks, out of which any 10 questions are to be answered. Apart from these, there are 6 long answer type questions, each carrying 5 marks, out of which any 3 questions are to be answered.
4. Minimum 30% marks in each subject (30 out of 100 for theory, adjusted for practicals where applicable).
5. Use of any electronic appliances is strictly prohibited.

2. The order and degree of the differential equation

$$2rx\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 + k\frac{d^3y}{dx^3} = 0$$

is:

(A) order = 2, degree = 1
(B) order = 2, degree = 2
(C) order = 1, degree = 2
(D) order = 1, degree = 1

---

3. The integrating factor of the differential equation

$$\frac{dy}{dt} + 2ty = \sin x$$

is:

(A) e^t
(B) e^{3x}
(C) e^{2x}
(D) e^{4x}

---

4. The solution of the differential equation

$$\frac{dy}{dx} = e^{x+y}$$

is:
(A) $e^x + e^{-y} = c$
(B) $e^x + e^y = c$
(C) $e^{-x} + e^y = c$
(D) $e^x + e^y = c$

---

5. The solution of the differential equation

$$\frac{dy}{dx} - \frac{y}{x} = e^x$$

is:
(A) $y = \log|x| + c$
(B) $y = e^x$
(C) $y = x\log|x| + e^x$
(D) $y = \log|x| + e^x$

---

6. The integrating factor of the differential equation

$$\frac{dy}{dx} + 2y = e^{3x}$$

is:
(A) e^{3x}
(B) e^{2x}
(C) e^x
(D) e^{4x}

---

7. Calculate the dot product:

$$(4\vec{i} + 3\vec{j} + 3\vec{k}) \cdot (6\vec{i} - 4\vec{j} + \vec{k}) = ?$$

(A) 22
(B) 15
(C) 21
(D) 18

---

8. Calculate the cross product:

$$(\vec{i} + 3\vec{j} - 2\vec{k}) \times (-\vec{i} + 3\vec{k}) = ?$$

(A) $9\vec{i} - \vec{j} + 3\vec{k}$
(B) $9\vec{i} + \vec{j} - 3\vec{k}$
(C) $\vec{i} - \vec{j} + 3\vec{k}$
(D) $\vec{i} + \vec{j} - 3\vec{k}$

9. Calculate the magnitude of the vector:

$$|\vec{i} - \vec{j} - \vec{k}| = ?$$

(A) $\sqrt{3}$
(B) 3
(C) 2
(D) 2

---

10. Calculate the dot product:

$$\vec{j} \cdot \vec{j} = ?$$

(A) 0
(B) 1
(C) -1
(D) $\vec{k}$

---

11. Calculate the cross product:

$$\vec{k} \times \vec{j} = ?$$

(A) $-\vec{i}$
(B) $\vec{j}$
(C) 0
(D) $\vec{k}$

---

12. Find the value of

$$\cos^{-1}\left(-\frac{1}{2}\right) = ?$$

(A) $\frac{3\pi}{2}$
(B) $\frac{3\pi}{1}$
(C) $\frac{\pi}{6}$
(D) $\frac{2\pi}{1}$

---

13. For $x \in [-1, 1]$, which of the following identities is true?

$$\cos^{-1} x = ?$$

(A) $\frac{\pi}{2} - \cot^{-1} x$
(B) $\frac{\pi}{2} - \sin^{-1} x$
(C) $\frac{\pi}{2} - \tan^{-1} x$
(D) $\frac{\pi}{2} - \sec^{-1} x$

---

14. For $x \in [-1, 1]$, find

$$\sin^{-1}(-x) = ?$$

(A) $-\sin^{-1} x$
(B) $\sin^{-1} x$
(C) $-\cos^{-1} x$
(D) $\cos^{-1} x$

---

15. For $|x| \geq 1$, find

$$\csc^{-1} x = ?$$

(A) $\sin^{-1} x$
(B) $\sin^{-1} \frac{1}{x}$
(C) $\cos^{-1} x$
(D) $\cos^{-1} \frac{1}{x}$

---

16. Calculate:

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

(A) 1
(B) 0
(C) 2
(D) 3

---

17. Find

$$\sin\left(\cot^{-1} x\right) = ?$$

(A) $\frac{1}{\sqrt{1+x^2}}$
(B) x
(C) $(1+x^2)^{-\frac{3}{2}}$
(D) $\frac{1}{1+x^2}$

---

18. Find

$$\cos^{-1}\left(\cos \frac{6\pi}{7}\right) = ?$$

(A) $\frac{6\pi}{7}$
(B) $\frac{6\pi}{5}$
(C) $\frac{3\pi}{7}$
(D) $\frac{6\pi}{1}$

---

19. Calculate:

$$3\pi - \sin^{-1}\left(-\frac{1}{2}\right) = ?$$

(A) 0
(B) $\frac{3\pi}{2}$
(C) $\frac{2\pi}{3}$
(D) π

---

21. Let R be the relation on the set $\mathbb{N}$ defined by

$$R = \{(a, b) : a = b - 2, \quad b > 6\}.$$

Which of the following pairs belong to R?
(A) $(6, 8) \in R$
(B) $(2, 4) \in R$
(C) $(3, 8) \in R$
(D) $(1, 3) \in R$

---

22. The direction ratios of two straight lines are l, m, n and l_1, m_1, n_1. The lines will be perpendicular if:
(A)

$$\frac{l}{l_1} = \frac{m}{m_1}$$

(B)

$$l + m + n = 0$$

(C)

$$l^2 + m^2 + n^2 - l_1^2 + m_1^2 + n_1^2 = 0$$

(D)

$$ll_1 + mm_1 + nn_1 = 0$$

---

23. The direction ratios of a straight line are $1, 3, 5$. Then its direction cosines are:
(A) $\left(\frac{1}{\sqrt{1^2+3^2+5^2}}, \frac{3}{\sqrt{1^2+3^2+5^2}}, \frac{5}{\sqrt{1^2+3^2+5^2}}\right)$
(B) $\left(\frac{1}{7}, \frac{3}{7}, \frac{5}{7}\right)$
(C) $\left(\frac{5}{\sqrt{35}}, \frac{3}{\sqrt{35}}, \frac{1}{\sqrt{35}}\right)$
(D) None of these

---

24. The equation of the plane parallel to the plane

$$3x - 5y + 4z = 11$$

is:
(A) $3x - 5y + 4z = 21$

(B) $3x + 5y + 4z = 25$

(C) $3x + 5y - 4z = 35$

(D) None of these

---

25. Find the angle between the two planes

$$2x + y - 2z = 5 \quad \text{and} \quad 3x - 6y - 2z = 7.$$

(A) $\cos^{-1}\left(\frac{4}{21}\right)$
(B) 4
(C) $\cos^{-1}\left(\frac{16}{61}\right)$
(D) None of these

---

26. The distance of the plane

$$x - 2y + 4z = 9$$

from the point $(2, 1, -1)$ **is:**
(A) $\frac{13}{\sqrt{21}}$

(B) $\frac{13}{21}$

(C) 1

(D) None of these

---

27. If the two planes

$$2x - 4y + 3z = 5$$

and

$$x + 2y + kz = 12$$

are mutually perpendicular, then the value of k **is:**
(A) -2

(B) 2

(C) 3

(D) None of these

---

28. If the line

$$\frac{x-3}{a} = \frac{y-4}{b} = \frac{z-5}{c}$$

is parallel to the line

$$\frac{x}{5} = \frac{y}{3} = \frac{z}{2},$$

then:
(A) $5a + 3b + 2c = 0$

(B) $\frac{a}{5} = \frac{b}{3} = \frac{c}{2}$

(C) $5a = 3b = 2c$

(D) None of these

---

29. If the line

$$\frac{x-x_1}{a_1} = \frac{y-y_1}{b_1} = \frac{z-z_1}{c_1}$$

is parallel to the plane

$$ax + by + cz + d = 0,$$

then:
(A) $aa_1 + bb_1 + cc_1 = 0$

(B) $ax + by + cz = 0$

(C) $a^2 + b^2 + c^2 = 0$

(D) None of these

---

31. If

$$\frac{18}{x^2} = \frac{6}{18^2},$$

then x is equal to:
(A) 6

(B) ± 6

(C) -6

(D) 0

---

30. Evaluate the integral

$$\int \sin 2x \, dx = ?$$

(A) $\sin x + \cos x + c$

(B) $\sin x - \cos x + c$

(C) $\cos x - \sin x + c$

(D) $\tan x - \cot x + c$

---

32. If

$$\frac{x}{x-1} \times \frac{x+1}{x} = ?$$

then the value is:
(A) 1

(B) 0

(C) 2

(D) -1

---

33. If the operation is defined as

$$ab = 2a + b^2,$$

then find $(23)4$.
(A) 30

(B) 20

(C) 18

(D) 15

---

34. Evaluate the determinant:

$$\begin{vmatrix} 1 & 2 & 5 \\ -2 & 1 & 4 \\ 0 & -3 & -9 \end{vmatrix} = ?$$

(A) 2

(B) 1

(C) 0

(D) -1

---

35. Evaluate the determinant:

$$\begin{vmatrix} 3 & 1 & 2 \\ -4 & 1 & 3 \\ 5 & -2 & 1 \end{vmatrix} =?$$

(A) 0

(B) 46

(C) -46

(D) 1

---

36. Find the product of the matrices:

$$\begin{bmatrix} 5 & 5 \\ 6 & 8 \end{bmatrix} \times \begin{bmatrix} 5 & 7 \end{bmatrix} =?$$

(A) $\begin{bmatrix} 25 & 35 \\ 30 & 8 \end{bmatrix}$

(B) $\begin{bmatrix} 25 & 35 \\ 30 & 40 \end{bmatrix}$

(C) $\begin{bmatrix} 5 & 35 \\ 6 & 40 \end{bmatrix}$

---

37. The function $f : A \to B$ will be onto if:

(A) $f(A) \subseteq B$

(B) $f(A) = B$

(C) $f(A) \neq B$

(D) None of these

---

38. A matrix A of order $m \times n$ is a square matrix if:

(A) $m = n$

(B) $m < n$

(C) $m > n$

(D) None of these

---

39. Calculate the product:

$$\begin{bmatrix} -3 \\ 5 \\ 2 \end{bmatrix} \times \begin{bmatrix} 1 & 6 & -4 \end{bmatrix} = ?$$

(A)
$$\begin{bmatrix} -3 & -18 & 12 \\ 5 & 30 & -20 \\ 2 & 12 & -8 \end{bmatrix}$$

(B)
$$\begin{bmatrix} -3 & -18 & 12 \\ 2 & 5 & -8 \\ 5 & 30 & -20 \end{bmatrix}$$

(C)
$$\begin{bmatrix} 5 & 30 & -20 \\ -3 & -18 & 12 \\ 2 & 12 & -8 \end{bmatrix}$$

(D)
$$\begin{bmatrix} 3 & 18 & 12 \\ 5 & 30 & 20 \\ 2 & 12 & 8 \end{bmatrix}$$

---

40. If

$$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix},$$

then $A^5 = ?$

(A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 5 \\ 5 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

---

41. If

$$A = \begin{bmatrix} r & 3 \\ -s & -1 \\ 2 & j \end{bmatrix},$$

then the adjoint of A is:

(A) $\begin{bmatrix} 25 & 13 \\ r & 3 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$

(C) $\begin{bmatrix} 25 & 13 \\ r & 3 \end{bmatrix}$

(D) None of these

---

42. The slope of the tangent to the curve $y = 2x^2 + 3\sin x$ at $x = 0$ is:

(A) 3

(B) 4

(C) 1

(D) -3

---

43. The rate of change of the area of a circle with respect to its radius r (in cm^2/cm) at $r = 6$ cm is:

(A) 10π

(B) 12π

(C) 8π

(D) 11π

---

44. If events A and B are independent, then:

(A) $P(A \cap B) = P(A)P(B)$

(B) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(C) $P(A \cup B) = 0$

(D) $P(A \cap B) = P(A) + P(B)$

45. The probability of drawing a king from a pack of 52 cards is:
(A) $\frac{1}{13}$

(B) $\frac{1}{52}$

(C) $\frac{4}{13}$

(D) $\frac{1}{4}$

---

46. Given $P(A) = 1$, $P(B) = 1$, $P(A \cap B) = 0$, find $P(B|A)$:
(A) $\frac{2}{5}$

(B) 1

(C) $\frac{1}{5}$

(D) $\frac{3}{5}$

---

47. A coin is tossed 10 times. The probability of getting exactly six heads is:
(A) $\binom{10}{6}$

(B) $\binom{10}{6}\left(\frac{1}{2}\right)^6$

(C) $\binom{10}{6}\left(\frac{1}{2}\right)^{10}$

(D) $\binom{10}{6}\left(\frac{1}{2}\right)^4$

---

48. Given $P(A) = \frac{7}{11}$, $P(A \cup B) = \frac{9}{11}$, find $P(A \cap B)$:
(A) $\frac{4}{11}$

(B) $\frac{7}{11}$

(C) $\frac{9}{11}$

(D) $\frac{2}{11}$

---

49. The equation of the xy-plane is:
(A) $x = 0$

(B) $y = 0$

(C) $z = 0$

(D) none of these

---

50. The direction cosines of the z-axis are:
(A) $(1, 0, 1)$

(B) $(0, 1, 0)$

(C) $(0, 0, 1)$

(D) $(0, 0, 0)$

---

51. The distance between the points $(4, 3, 7)$ and $(1, 2, 3)$ is:
(A) 13

(B) 15

(C) 12

(D) 5

---

52. Evaluate the integral $\int \frac{a}{a^2+x^2}\, dx$:
(A) $\frac{a}{1} \tan^{-1}\left(\frac{a}{x}\right) + c$

(B) $\tan^{-1}\left(\frac{a}{x}\right) + c$

(C) $\frac{a}{1} \tan^{-1}(x) + c$

(D) $\frac{a}{1} \tan^{-1}\left(\frac{a}{x}\right) + c$

---

53. Evaluate the integral $\int \sec x\, dx$:
(A) $\log|\sec x + \tan x| + c$

(B) $\log|\sec x - \tan x| + c$

(C) $\log \sec x + c$

(D) $\tan x + c$

---

54. Evaluate the integral $\int \sec^5 x \tan x \, dx$:
(A) $5 \tan^5 x + c$

(B) $\frac{1}{5} \sec^5 x + c$

(C) $5 \log |\cos x| + c$

(D) $\tan^5 x + c$

---

55. Evaluate the integral $\int \tan^2 x \, dx$:
(A) $\tan x + x + c$

(B) $\tan x - x + c$

(C) $\cot x + x + c$

(D) $\cot x - x + c$

---

56. Evaluate the integral $\int \cos^2 x \cdot \sin^2 x \, dx$:
(A) $\cot x - \tan x + c$

(B) $\tan x - \cot x + c$

(C) $-\cot x - \tan x + c$

(D) $-\tan x + c$

---

57. Evaluate the integral $\int \frac{x^2+1}{x^2+1} \, dx$:
(A) $3x^3 + c$

(B) $3x^3 - x + 2 \tan^{-1} x + c$

(C) $2 \tan^{-1} x + c$

(D) $3x^3 + x + 2 \tan^{-1} x + c$

---

58. Evaluate the integral $\int \frac{1+\cos 2x}{1-\cos 2x} \, dx$:
(A) $\tan x + c$

(B) $\tan x + x + c$

(C) $\tan x - x + c$

(D) $-\tan x + x + c$

---

59. Evaluate the integral $\int \frac{2}{2-3x}\,dx$:
(A) $-3\log|2-3x| + c$

(B) $-\frac{3}{1}\log|2-3x| + c$

(C) $-\log|2-3x| + c$

(D) $2\tan^{-1} x + c$

---

60. Evaluate the integral $\int \frac{1+x}{x^3}\,dx$:
(A) $\tan^{-1}\left(\frac{x}{4}\right) + c$

(B) $4\tan^{-1}\left(\frac{x}{4}\right) + c$

(C) $\frac{1}{4}\tan^{-1}\left(\frac{x}{4}\right) + c$

(D) $2\tan^{-1}\left(\frac{x}{4}\right) + c$

---

61. Evaluate the integral $\int xe^x\,dx$:
(A) $e^x + c$

(B) $x - 1 + c$

(C) $e^x(x-1) + c$

(D) $e^x(x+1) + c$

---

62. Find the derivative of $\log(\sec x + \tan x)$:
(A) $\sec x + \tan x$

(B) $\sec x$

(C) $\tan x$

(D) $\frac{1}{\sec x+\tan x}$

---

63. Find the derivative of $\sec^{-1}(x) + \csc^{-1}(x)$**:**
(A) 1

(B) 0

(C) 2

(D) -1

---

64. If $y = \tan\left(\frac{1}{\sin x}\right)$**, then find** $\frac{dy}{dx}$**:**
(A) 1

(B) -1

(C) $\frac{1}{2}$

(D) $-\frac{1}{2}$

---

65. If $x = a\sec\theta$ **and** $y = b\tan\theta$**, then find** $\frac{dx}{d\theta}$**:**
(A) $-a\sec\theta$
(B) $-\csc\theta$
(C) $\cot\theta$
(D) $\frac{a}{b}$

---

66. If $y = \sin x + \sin x + \sin x + \ldots$ **to** ∞**, then find** y**:**
(A) $y = \sin x$
(B) $2y - 1 = \sin x$
(C) $2y - 1 = \cos x$
(D) $2y - 1 = 1$

---

1. If $y = x^{20}$**, then** $\frac{d^2y}{dx^2}$ **is:**
(A) x^{18}
(B) $20x^{19}$
(C) $380x^{18}$
(D) x^1

Question:

$$\int (1 + \cos 2x)\ dx$$

(A) $2\cos x + c$ (B) $2\sin x + c$ (C) $\frac{x^2}{2} + c$ (D) $2\sin^2 x + c$

Question:

$$\int x \log x\, dx$$

(A) $\frac{1}{2}(\log x)^2 + c$ (B) $-\frac{1}{2}(\log x)^2 + c$ (C) $\frac{x^2}{2} + c$ (D) $-\frac{x^2}{2} + c$

Question:

$$\int x \cos x\, dx$$

(A) $2\sin x + c$ (B) $\sin x + c$ (C) $\cos x + c$ (D) $2\cos x + c$

Question:

$$\int \cos x \sin x\, dx$$

(A) $\frac{3}{2}(\cos x)^{3/2} + c$ (B) $-\frac{3}{2}(\cos x)^{3/2} + c$ (C) $(\cos x)^{3/2} + c$ (D) $-(\cos x)^{3/2} + c$

---

1. If $A = \begin{bmatrix} 2 & 4 \\ -3 & 6 \end{bmatrix}$**, then** A^{-1} **is:**

(A) $\begin{bmatrix} 4 & 1 \\ 6 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} 4 & 1 \\ -6 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 4 & 6 \\ 8 & 12 \end{bmatrix}$

(D) $\begin{bmatrix} 4 & -6 \\ 8 & 12 \end{bmatrix}$

---

1. If $A = \begin{bmatrix} 3 & -5 \\ 6 & 4 \end{bmatrix}$ **and** $B = \begin{bmatrix} 7 & 5 \\ 8 & 6 \end{bmatrix}$**, then** $6A - 5B$ **is:**

(A) $\begin{bmatrix} 17 & 5 \\ 4 & 54 \end{bmatrix}$

(B) $\begin{bmatrix} 17 & 5 \\ -4 & 54 \end{bmatrix}$

(C) $\begin{bmatrix} -17 & -55 \\ -4 & -6 \end{bmatrix}$

(D) $\begin{bmatrix} 17 & -55 \\ -4 & -54 \end{bmatrix}$

---

1. If $A = \begin{bmatrix} 2 & 3 \\ 2 & -2 \\ 0 & 5 \\ 2 & \end{bmatrix}$, then A' is:

(A) $\begin{bmatrix} 2 & 2 \\ 0 & 3 \\ -2 & 2/5 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 0 \\ 2 & -2 \\ 2/5 & 3 \end{bmatrix}$

(C) $\begin{bmatrix} 3 & -2 \\ -2/5 & 2 \\ 2 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 3 & 2 \\ -2 & 2 \\ 2/5 & 0 \end{bmatrix}$

---

1. If $2A + B + X = 0$, where $A = \begin{bmatrix} -1 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$, then X is:

(A) $\begin{bmatrix} 1 & -7 \\ 2 & -13 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 7 \\ 2 & 13 \end{bmatrix}$

(C) $\begin{bmatrix} -1 & -7 \\ -2 & -13 \end{bmatrix}$

(D) $\begin{bmatrix} -1 & 7 \\ -2 & 13 \end{bmatrix}$

---

1. Given the matrix equation $\begin{bmatrix} x & y \end{bmatrix} = \begin{bmatrix} 2x - 1 & 9 \end{bmatrix}$, find the values of x and y:

(A) $x = 3, y = 9$

(B) $x = 1, y = 9$

(C) $x = 0, y = 9$

(D) $x = 3, y = 4$

---

1. Find the derivative: $\frac{d}{dx}(\sin^2 x) =$
(A) $2 \sin x$

(B) $\sin 2x$

(C) $\cos 2x$

(D) $2 \cos x$

---

1. Find the derivative: $\frac{d}{dx}(x^5 + \cos 2x) =$
(A) $5x^4 + \sin 2x$

(B) $5x^4 + \cos 2x$

(C) $5x^4 - 2 \sin 2x$

(D) $x^5 + 2 \sin 2x$

---

1. Find the derivative: $\frac{d}{dx}(\sec^{-1} x) =$
(A) $\frac{1}{\sqrt{1-x^2}}$

(B) $\frac{1}{x\sqrt{x^2-1}}$

(C) $\frac{1}{\sqrt{1+x^2}}$

(D) $-\frac{1}{x\sqrt{x^2-1}}$

---

1. Find the derivative: $\frac{d}{dx}(a^x) =$
(A) $a^x \log a$

(B) $a^x \log x$

(C) a^x

(D) $\log a$

---

1. Find the derivative: $\frac{d}{dx}[\log(\cos x)] =$
(A) $\tan x$

(B) $-\tan x$

(C) $\cot x$

(D) $-\cot x$

---

1. Evaluate: $\int (x + \cos 2x)\, dx =$
(A) $\frac{1}{2}x \sin 2x + \frac{1}{4}\cos 2x + c$

(B) $\frac{1}{2}x \sin 2x - \frac{1}{4}\cos 2x + c$

(C) $2x \sin 2x + 4 \cos 2x + c$

(D) $\frac{2}{x^2} + \frac{2}{\sin 2x} + c$

---

1. Evaluate:

$$\int e^x \left(\sin^{-1} x + \frac{1}{\sqrt{1-x^2}} \right) dx =$$

(A) $e^x \cdot \frac{1}{\sqrt{1-x^2}} + c$

(B) $e^x \sin^{-1} x + c$

(C) $2e^x + c$

(D) $e^x \cos^{-1} x + c$

---

1. Evaluate:

$$\int \frac{x}{x(x+2)}\, dx =$$

(A) $\log \left| \frac{x+2}{x} \right| + c$

(B) $\frac{1}{2} \log \left| \frac{x+2}{x} \right| + c$

(C) $\log |x| + c$

(D) $\log|x+2|+c$

---

1. Evaluate:

$$\int \sqrt{a^2-x^2}\,dx = \ ?$$

(A) $\frac{2x}{\sqrt{a^2-x^2}}$

(B) $\frac{2}{a^2}\sin^{-1}\left(\frac{a}{x}\right)+c$

(C) $\frac{2x}{\sqrt{a^2-x^2}}+\frac{2}{a^2}\sin^{-1}\left(\frac{a}{x}\right)+c$

(D) $\frac{2x}{\sqrt{x^2-a^2}}-\frac{2}{a^2}\sin^{-1}\left(\frac{a}{x}\right)+c$

---

1. Evaluate:

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x\,dx = ?$$

(A) -1

(B) 0

(C) 1

(D) 2

---

1. Evaluate:

$$\int_0^a \left(\sqrt{x}+\frac{\sqrt{a-x}}{\sqrt{x}}\right)dx = ?$$

(A) a

(B) $2a$

(C) $2a$

(D) $3a$

---

1. Evaluate:

$$\int_0^{\frac{\pi}{2}} \cos 2x\,dx = ?$$

(A) 0

(B) 1

(C) -1

(D) 2

---

1. Evaluate:

$$\int_0^{\frac{\pi}{6}} \cos x \cdot \cos 2x \, dx = ?$$

(A) $\frac{5}{6}$

(B) $\frac{1}{6}$

(C) $\frac{5}{12}$

(D) $-\frac{5}{12}$

---

1. Evaluate:

$$\int_{-\pi}^{\pi} \tan x \, dx = ?$$

(A) -1

(B) 0

(C) 2

(D) -2

---

1. Evaluate:

$$\int_4^9 \frac{1}{\sqrt{x}} \, dx = ?$$

(A) 2

(B) $\frac{\pi}{6}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

---

1. If a, b, c are real numbers, evaluate:

$$a \times (b + c) + b \times (c + a) + c \times (a + b) =?$$

(A) 1

(B) 0

(C) -1

(D) 3

---

1. Evaluate the scalar triple product:

$$\mathbf{i} \cdot (\mathbf{j} \times \mathbf{k}) =?$$

(A) 1

(B) 0

(C) -1

(D) $\mathbf{i}$

---

1. If $\mathbf{a} = \mathbf{i} + \mathbf{j} + 2\mathbf{k}$, then the corresponding unit vector $\hat{\mathbf{a}}$ in the direction of a is:
(A) $\frac{1}{6}\mathbf{i} + \mathbf{j} + \mathbf{k}$

(B) $\frac{1}{6}\mathbf{i} + \mathbf{j} + 2\mathbf{k}$

(C) $\frac{1}{\sqrt{6}}\mathbf{i} + \mathbf{j} + 2\mathbf{k}$

(D) $\frac{1}{\sqrt{6}}\mathbf{i} + \mathbf{j} + \mathbf{k}$

---

1. If vectors $3\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ and $\mathbf{i} + \lambda\mathbf{j} - 3\mathbf{k}$ are perpendicular to each other, then the value of λ is:
(A) 3

(B) -6

(C) -9

(D) -1

---

1. Evaluate the integral:

$$\int \cot^2 x \, dx = ?$$

(A) $\cot x + x + k$

(B) $-\cot x + x + k$

(C) $-\cot x - x + k$

(D) $\cot x - x + k$

---

1. Find the angle between the vectors $\mathbf{A} = 2\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$ and $\mathbf{B} = \mathbf{i} + 4\mathbf{j} - 5\mathbf{k}$:
(A) $30°$

(B) $60°$

(C) $45°$

(D) $90°$

---

1. If $|\mathbf{a} + \mathbf{b}| = |\mathbf{a} - \mathbf{b}|$, then:
(A) $|\mathbf{a}| = |\mathbf{b}|$

(B) $\mathbf{a} \perp \mathbf{b}$

(C) $\mathbf{a} = \mathbf{b}$

(D) $|\mathbf{a}| = 0$

---

1. Find the projection of the vector $\mathbf{u} = \mathbf{i} - 2\mathbf{j} + \mathbf{k}$ on the vector $\mathbf{v} = 4\mathbf{i} + 4\mathbf{j} + \mathbf{k}$:
(A) 9

(B) $\frac{19}{9}$

(C) $\frac{9}{19}$

(D) 19

---

1. Find the minimum value of

$$Z = 3x + 5y$$

subject to the constraints:

$$x + y \leq 2, \quad x \geq 0, \quad y \geq 0$$

(A) 16

(B) 15

(C) 0

(D) None of these

---

1. Find the maximum value of

$$Z = 3x + 2y$$

subject to the constraints:

$$3x + y \leq 15, \quad x \geq 0, \quad y \geq 0$$

(A) 30

(B) 15

(C) 10

(D) None of these

---

1. Solve the differential equation:

$$x^2 \frac{dy}{dx} = 2xy$$

---

1. Evaluate the determinant:

$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$

---

1. If

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -2 & 3 & -2 \\ -4 & 4 & -3 \end{bmatrix}$$

show that $A^2 = A$.

---

1. If $y = \sin(xy)$, then find $\frac{dx}{dy}$.

---

1. Evaluate the integral:

$$\int (x+2)^2\, dx$$

---

1. Evaluate $P(A \cup B)$ if $2P(A) = P(B) = \frac{13}{5}$ and $P(A \mid B) = \frac{5}{2}$.

---

1. Find the mean for the following probability distribution:

x_i	0	1	2	3
p_i	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

---

1. If $\mathbf{a} = \mathbf{i} - \mathbf{j} + \mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} + \mathbf{j} + 3\mathbf{k}$, then find the value of $|\mathbf{a} + \mathbf{b}|$.

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1. Find the direction cosines of the vector $-3\mathbf{i} - 4\mathbf{j} + 12\mathbf{k}$.

---

1. If $y = x \sin x$, find $\frac{dy}{dx}$.

---

1. Find the value of

$$\int_0^{\frac{\pi}{2}} \frac{1}{1+\tan x}\, dx.$$

---

1. Find the value of

$$\int_0^a \sqrt{a^2 - x^2}\, dx.$$

---

1. Find the distance between the planes

$$x - 2y + 2z = 6 \quad \text{and} \quad 3x - 6y + 6z = 2.$$

---

1. Find the equation of the plane whose intercepts on the axes x, y, and z are respectively 2, 3, and -4.

---

1. Find the value of p so that the lines

$$\frac{2x-1}{3} = \frac{y-2}{p} = \frac{z+17}{1}$$

and

$$\frac{2x+4}{2} = \frac{y+9}{2} = \frac{z-1}{2}$$

are mutually perpendicular.

---

1. Integrate

$$\int \cos^3 x \cdot \sin x \, dx.$$

---

1. Integrate

$$\int \frac{x^2+4}{x^2-1} \, dx.$$

---

1. Solve

$$\frac{dx}{dy} = e^{x+y}.$$

---

1. Given the equation $x \cos y = \sin(x+y)$, find $\frac{dx}{dy}$.

---

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

---

1. If $x = \frac{1+t}{2}$, $y = \frac{1-t}{2}$, then find $\frac{dx}{dy}$.

---

1. Find $f \circ g$ and $g \circ f$ if $f(x) = 8x^3$ and $g(x) = x^{1/3}$.

---

1. Find the angle between the vectors $\mathbf{A} = 5\mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{B} = 6\mathbf{i} - 8\mathbf{j} - \mathbf{k}$.

---

1. Maximize $Z = 20x + 3y$, subject to the constraints

$$3x + 2y \leq 210, \quad x \geq 0, \quad y \geq 0.$$

---

1. Find the value of

$$I = \int_0^{\frac{\lambda}{2}} x \cos x \, dx.$$

---

1. Integrate

$$\int \sin^3 x \, dx.$$

---

1. Integrate

$$\int \left(\frac{1}{x+1} + \frac{1}{x+2} \right) dx.$$

---

1. Prove that

$$4 \left(\cot^{-1} 3 + \cot^{-1} 2 \right) = \pi.$$

---

1. Prove that

$$\tan^{-1} x + \tan^{-1} y = \tan^{-1} \left(\frac{1 - xy}{x + y} \right).$$

---

1. Find $\frac{dx}{dy}$ if $y = \sin(x^2)$.

---

1. Prove that

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

---

1. Evaluate

$$\int_0^{\frac{\pi}{2}} \log(\cos x)\, dx.$$

---

1. Solve:

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

---

1. Find

$$\frac{dx}{dy}, \text{ when } (\sin y)^x = (\cos x)^y.$$

---

1. Evaluate the determinant:

$$\text{Determinant} = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}.$$

---

1. Evaluate:

$$(\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}) \cdot [(2\mathbf{i} - \mathbf{j}) \times (\mathbf{j} + \mathbf{k})]\,.$$

---

1. Minimize $Z = -2x + y$, subject to $5x + 10y \leq 50$, $x + y \geq 1$, $y \leq 4$, $x \geq 0$, $y \geq 0$.

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1. In four throws with a pair of dice, what is the probability of occurrence of doublets at least twice?
