CBSE

DETERMINANTS WS 1

Class 12 - Mathematics

1. The matrix $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is **[1]**

a) Orthogonal

b) Nonsingular

c) Idempotent

d) Nilpotent

2. The system AX = B of n equations in n unknowns has infinitely many solutions if **[1]**

a) if det.A = 0, (adj A)B$\neq$O

b) det. A$\neq$0

c) if det. A$\neq$ 0, (adjA)B$\neq$ O

d) if det. A = 0 , (adj A) B =O

3. The value of the determinant $\begin{vmatrix} \log_3 512 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix}$ is **[1]**

a) 0

b) 15

c) $\frac{15}{2}$

d) 10

4. If A = $\begin{vmatrix} 5 & 3 \\ 14 & 11 \end{vmatrix}$ then $13A^{-1}$ equals **[1]**

a) A

b) adj A

c) $\frac{1}{13}$A

d) 2A

5. The value of $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ is **[1]**

a) 1

b) x + y + z

c) 2(x + y + z)

d) 0

6. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then x is equal to **[1]**

a) -6

b) 0

c) 6

d) ± 6

7. If the points (2, -3), (λ, -1) and (0, 4) are collinear, find the value of λ. **[1]**

a) 7

b) 0

c) 10

d) $\frac{10}{7}$

8. If A, B are non-singular square matrices of the same order, then $(AB^{-1})^{-1}$ = **[1]**

a) BA^{-1}

b) $A^{-1}B^{-1}$

c) $A^{-1}B$

d) AB

[1]

9. If cos 2θ = 0, then $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}^2$ is equal to

a) $\frac{1}{2}$
b) -1
c) $\frac{-1}{2}$
d) 1

10. If A·(adj A) = $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then the value of |A| + |adj A| is equal to: **[1]**

a) 12
b) 3
c) 27
d) 9

11. If the system of equations 4x - 3y = 3; 3x - 5y = 7 has unique solution, then **[1]**

a) $x = -\frac{6}{11}, y = -\frac{19}{11}$
b) $x = -\frac{6}{11}$ and $y = \frac{19}{11}$
c) $x = \frac{6}{11}$ and $y = \frac{19}{11}$
d) $x = \frac{6}{11}$ and $y = -\frac{9}{11}$

12. If A is a singular matrix, then A(adj A) is **[1]**

a) Scalar matrix
b) Inverse matrix
c) Identity matrix
d) Null matrix

13. If A and B are invertible matrices, then which of the following is not correct? **[1]**

a) $(AB)^{-1} = B^{-1} A^{-1}$
b) $(A + B)^{-1} = B^{-1} + A^{-1}$
c) $\det (A)^{-1} = [\det (A)]^{-1}$
d) $\text{adj } A = |A| \cdot A^{-1}$

14. If A, B are two n × n non - singular matrices, then what can you infer about AB? **[1]**

a) AB is singular
b) $(AB)^{-1}$ does not exist
c) AB is non-singular
d) $(AB)^{-1} = A^{-1}B^{-1}$

15. The area of the triangle, whose vertices are (3, 8), (-4, 2) and (5, 1), is **[1]**

a) 60 sq. units
b) $\frac{61}{2}$ sq. units
c) 61 sq. units
d) 30 sq. units

16. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then det (adj A) equals **[1]**

a) a^2
b) a^6
c) a^9
d) a^{27}

17. For non-singular square matrix A,B and C of the same order $(AB^{-1}C)^{-1}$ = **[1]**

a) $C^{-1}BA^{-1}$
b) CBA^{-1}
c) $C^{-1} B^{-1}A^{-1}$
d) $A^{-1}BC^{-1}$

18. The existence of the unique solution of the system of equations: **[1]**

x + y + z= λ

5x - y + μ z = 10

2x+ 3y - z = 6 depends on

a) λ and μ both

b) λ only

c) neither λ nor μ

d) μ only

19. If $A = \begin{bmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$, then A^{-1} exists if. **[1]**

a) λ = 2

b) $\lambda \neq$ -2

c) None of these

d) $\lambda \neq 2$

20. If $A = \begin{bmatrix} 3 & -4 \\ -1 & 2 \end{bmatrix}$ and B is square matrix of order 2 such that AB = I then B =? **[1]**

a) $\begin{bmatrix} 1 & \frac{1}{2} \\ 2 & \frac{3}{2} \end{bmatrix}$

b) $\begin{bmatrix} 1 & 2 \\ \frac{1}{2} & \frac{3}{2} \end{bmatrix}$

c) $\begin{bmatrix} 1 & 4 \\ 2 & 4 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

21. Let f(x) = $\begin{vmatrix} x & -4 & 5 \\ 1 & 1 & -2 \\ 2 & x & 1 \end{vmatrix}$, then f'(5) is equal to **[1]**

a) 40

b) 1

c) 26

d) 24

22. The equations, x + 4y – 2z = 3, 3x + y + 5z = 7, 2x + 3y +z = 5 have **[1]**

a) no solution

b) two solution

c) a unique solution

d) infinitely many solutions

23. The value of the determinant $\Delta = \begin{vmatrix} 1 & 2 & 4 \\ -1 & 3 & 0 \\ 4 & 1 & 0 \end{vmatrix}$ is **[1]**

a) 44

b) -52

c) 52

d) -44

24. Let Δ = $\begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$, where $0 \leq \theta \leq 2\pi$, then **[1]**

a) $\Delta \in [2, 4]$

b) $\Delta \in (2, 4)$

c) $\Delta \in (2, \infty)$

d) Δ= 0

25. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then **[1]**

a) a = 0, b = 1

b) a = cos 2θ, b = sin 2θ

c) a = 1, b = 1

d) a = sin 2θ, b = cos 2θ

26. The matrix $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ is **[1]**

a) Singular

b) Nilpotent

c) Orthogonal

d) Idempotent

27. Let matrix A = $\begin{vmatrix} x & 3 & 4 \\ 1 & y & 2 \\ 3 & 3 & z \end{vmatrix}$, if xyz = 1, 6x + 12y + 3z = 21, then A(adj A) is equal to [1]

a) $\begin{vmatrix} 20 & 0 & 0 \\ 0 & 20 & 0 \\ 0 & 0 & 20 \end{vmatrix}$

b) $\begin{vmatrix} 15 & 0 & 0 \\ 0 & 15 & 0 \\ 0 & 0 & 15 \end{vmatrix}$

c) $\begin{vmatrix} 10 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 10 \end{vmatrix}$

d) $\begin{vmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{vmatrix}$

28. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is [1]

a) 3

b) ± 3

c) 6

d) ± 6

29. If A = $\begin{vmatrix} 3 & 1 \\ 2 & 5 \end{vmatrix}$ then find A^{-1}. [1]

a) $\frac{1}{2}\begin{vmatrix} 5 & -1 \\ -2 & 3 \end{vmatrix}$

b) $\begin{vmatrix} 5 & -1 \\ -2 & 3 \end{vmatrix}$

c) $\frac{1}{13}\begin{vmatrix} 5 & 2 \\ -1 & 3 \end{vmatrix}$

d) $\frac{1}{13}\begin{vmatrix} 5 & -1 \\ -2 & 3 \end{vmatrix}$

30. Find the matrix X for which $\begin{vmatrix} 1 & -4 \\ 3 & -2 \end{vmatrix}$X = $\begin{vmatrix} -16 & -6 \\ 7 & 2 \end{vmatrix}$ [1]

a) $\begin{vmatrix} 6 & 2 \\ 11 & 2 \end{vmatrix}$

b) $\begin{vmatrix} 6 & 2 \\ 11/2 & 2 \end{vmatrix}$

c) $\begin{vmatrix} 6 & 2 \\ -11 & 2 \end{vmatrix}$

d) $\begin{vmatrix} 11 & 0 \\ 6 & 0 \end{vmatrix}$

31. If A = $\begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$, then find the value of k if |2A| = k|A| [1]

a) - 4

b) 4

c) 0

d) 3

32. The value of determinant $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}$ is equal to [1]

a) 1

b) x^2

c) x

d) 0

33. If, A = $\begin{bmatrix} 1 & 4 \\ 3 & 15 \end{bmatrix}$, then $|A^{-1}|$ is equal to [1]

a) $\frac{2}{3}$

b) $\frac{4}{3}$

c) $\frac{1}{3}$

d) $-\frac{1}{3}$

34. The three points (a + 5, a - 4), (a - 2, a + 3) and (a, a) [1]

a) do not lie in a straight line

b) coincide

c) lie in a straight line

d) are vertices of equilateral triangle

35. For what value of λ the following system of equations does not have a solution x + y + z = 6, 4x + λy - λz = 0, 3x + 2y – 4z = - 5 ? [1]

a) 1

b) -3

c) 0

d) 3

36. Using matrix method to solve the following system of equations: 5x - 7y = 2, 7x - 5y = 3, value of x, y is **[1]**

a) x = 1, y = 1

b) x = $\frac{11}{24}$, y = $\frac{1}{24}$

c) x = $\frac{10}{24}$, y = $\frac{1}{24}$

d) x = $\frac{-11}{24}$, y = $\frac{1}{24}$

37. The value of $(A^{-1})^T$ is **[1]**

a) A^T

b) $\left(A^T\right)^{-1}$

c) A^{-1}

d) I

38. The area of a triangle with vertices (–3, 0), (3, 0) and (0, k) is 9 sq. units. The value of k will be **[1]**

a) 6

b) 3

c) -9

d) 9

39. The system of equations, 3x + y – z = 0, 5x + 2y – 3z = 2, 15x + 6y – 9z = 5 has **[1]**

a) a unique solution

b) two distinct solutions

c) no solution

d) infinitely many solutions

40. If A = $\begin{vmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{vmatrix}$ and A(adj A) = $\begin{vmatrix} k & 0 \\ 0 & k \end{vmatrix}$, then find the value of k. **[1]**

a) 1

b) 0

c) -1

d) 2

41. If the trace of the matrix **[1]**

A = $\begin{vmatrix} x-5 & 0 & 2 & 4 \\ 3 & x^2-10 & 6 & 1 \\ -2 & 3 & x-7 & 1 \\ 1 & 2 & 0 & -2 \end{vmatrix}$ assumes the value zero, then the value of x equals to

a) 6, 4

b) -6, 4

c) 6, -4

d) -6, -4

42. If the system of equations ax + y + z = 0, x + by + z = 0, x + y + cz = 0, (a, b, c $\neq$ 1) has a non-trivial solution then the value $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c}$ equals. **[1]**

a) -1

b) 0

c) -2

d) 1

43. The adjoint of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is **[1]**

a) $\begin{bmatrix} 4 & -2 \\ -3 & -1 \end{bmatrix}$

b) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}$

d) $\begin{bmatrix} 4 & -2 \\ 1 & -3 \end{bmatrix}$

44. Let A be the area of a triangle having vertices (x_1, y_1), (x_2, y_2) and (x_3, y_3). Which of the following is correct? **[1]**

a)

b)

$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = A^2$

$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm A$

c) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm \frac{A}{2}$

d) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm 2A$

45. A(adj A) is equal to **[1]**

a) A

b) I

c) |A|I

d) O

46. If A and B are square matrices such that $B = -A^{-1}BA$, then $(A + B)^2 =$ **[1]**

a) O

b) A + B

c) $A^2 + B^2$

d) $A^2 + 2AB + B^2$

47. Let A = $\begin{vmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{vmatrix}$ then A^TA is **[1]**

a) $\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}$

b) $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

c) $\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix}$

d) $\begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix}$

48. Let a, b, c be positive real numbers.What type of solutions do the following system of equations in x, y and z has? **[1]**

$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1, \frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

a) finitely many solutions

b) no solution

c) unique solution

d) infinitely many solutions

49. From the matrix equation AB = AC, we say B = C provided A is **[1]**

a) square matrix

b) skew symmetric matrix

c) singular matrix

d) non-singular matrix

50. If A is a matrix of order 3 and |A| = 8, then |adj A| = **[1]**

a) 2

b) 1

c) 2^6

d) 2^3

51. The pair of equations 3x - 5y = 7 and 6x - 10y = 14 have: **[1]**

a) a unique solution

b) two solutions

c) no solution

d) infinitely many solution

52. The system of equations **[1]**

x + y + z = 2,

3 x - y + 2z = 6

3x + y + z = -18

has:

a) zero solution as the only solution

b) an infinite number of solutions

c) a unique solution

d) no solution

53. If A is a matrix of order 3 × 3, then |3A| is equal to **[1]**

a) 81 IAI

b) 27 IAI

c) 9 IAI

d) 3 IAI

54. If $A=\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$ then A^{-1} = ? **[1]**

a) -adj A

b) adj A

c) -A

d) A

55. If the area of a △ABD is 3 sq. units with vertices A(1, 3), B(0, 0) and D(k, 0), then k is equal to **[1]**

a) 3

b) 2

c) ± 2

d) ± 3

56. If $A=\begin{bmatrix}2 & -1\\ 1 & 3\end{bmatrix}$, then A^{-1} = ? **[1]**

a) $\begin{bmatrix}\frac{3}{7} & \frac{1}{7}\\ \frac{-1}{7} & \frac{2}{7}\end{bmatrix}$

b) $\begin{bmatrix}\frac{3}{7} & \frac{-1}{7}\\ \frac{1}{7} & \frac{2}{7}\end{bmatrix}$

c) $\begin{bmatrix}\frac{1}{5} & \frac{2}{7}\\ \frac{1}{7} & \frac{3}{7}\end{bmatrix}$

d) $\begin{bmatrix}\frac{1}{3} & \frac{1}{7}\\ \frac{1}{7} & \frac{2}{7}\end{bmatrix}$

57. The matrix $\begin{bmatrix}5 & 10 & 3\\ -2 & -4 & 6\\ -1 & -2 & b\end{bmatrix}$ is a singular matrix, if the value of b is **[1]**

a) 3

b) Non-existent

c) -3

d) 0

58. The system of equations, x + y + z = 1, 3x + 6y + z = 8, αx + 2y + 3z = 1 has a unique solution for **[1]**

a) all real α

b) α not equal to 0

c) all integral α

d) all rational α

59. If $\begin{bmatrix}x & y\\ 3y & x\end{bmatrix}\begin{bmatrix}1\\ 2\end{bmatrix}=\begin{bmatrix}3\\ 5\end{bmatrix}$ then find x and y ? **[1]**

a) x = 2, y = 2

b) x = 1, y = 2

c) x = 2, y = 1

d) x = 1, y = 1

60. If $S=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$, then adj A is **[1]**

a) $\begin{bmatrix}d & -b\\ -c & a\end{bmatrix}$

b) $\begin{bmatrix}-d & -b\\ -c & a\end{bmatrix}$

c) $\begin{bmatrix}d & c\\ b & a\end{bmatrix}$

d) $\begin{bmatrix}d & b\\ c & a\end{bmatrix}$

61. The inverse of the matrix $\begin{vmatrix}2 & -1\\ 3 & 4\end{vmatrix}$ is **[1]**

a) $\begin{vmatrix}2 & 1\\ 0 & 3\end{vmatrix}$

b) $\begin{vmatrix}0 & 0\\ 0 & 0\end{vmatrix}$

c) $\begin{vmatrix} 4/11 & 1/11 \\ -3/11 & 2/11 \end{vmatrix}$

d) $\begin{vmatrix} 4 & 1 \\ -3 & 2 \end{vmatrix}$

62. If A is skew symmetric matrix of order 3, then the value of |A| is: **[1]**

a) 9

b) 3

c) 0

d) 27

63. If P is a 3 $\times$ 3 matrix such that P' = 2P + I, where P' is the transpose of P and I is 3 $\times$ 3 identity matrix, then there exists a column matrix X = $\begin{vmatrix} x \\ y \\ z \end{vmatrix} \neq \begin{vmatrix} 0 \\ 0 \\ 0 \end{vmatrix}$ such that **[1]**

a) PX = 2X

b) PX = $\begin{vmatrix} 0 \\ 0 \\ 0 \end{vmatrix}$

c) PX = -X

d) PX = X

64. The number of solutions of 2x + y = 4, x – 2y = 2, 3x + 5y = 6 is **[1]**

a) Two solution

b) Infinitely many solution

c) One solution

d) No solution

65. If A is a square matrix such that A^2 = A, then, det.(A) = ______ **[1]**

a) 2 or -2

b) 0 or - 1

c) 1 or - 1

d) 0 or 1

66. The system of linear equations x + y + z = 2, 2x + y - z = 3, 3x + 2y - kz = 4 has a unique solution if , **[1]**

a) k = 0

b) -1 < k < 1

c) -2 < k < 2

d) $k \neq 0$

67. If the points (a_1, b_1), (a_2, b_2) and (a_1 + a_2, b_1 + b_2) are collinear, then **[1]**

a) a_1 - b_1 = a_2 - b_1

b) a_1a_2 = b_1b_2

c) a_1b_2 = a_2b_1

d) a_1b_1 = a_2b_2

68. The determinant $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is **[1]**

a) independent of both θ and x

b) independent of x only

c) independent of -x only

d) independent of θ only

69. If A = $\begin{vmatrix} 1 & 0 & 0 \\ 1 & 1 & 2 \\ 3 & -1 & 9 \end{vmatrix}$, then the value of det (Adj (Adj A)) equals **[1]**

a) 14641

b) 121

c) 11

d) 1331

70. If A = $\begin{bmatrix} 1 & 2 \\ 6 & 12 \end{bmatrix}$, then A is **[1]**

a) non-singular

b) singular

c) scalar matrix

d) diagonal matrix

71. If A and B are any 2 $\times$ 2 matrices, then det. (A+B) = 0 implies **[1]**

a) detA + det B = 0

b) det A = 0 or det B = 0

c) None of these

d) det A = 0 and det B = 0

72. An ordered pair (α, β) for which the system of linear equations **[1]**

(1 + α)x + βy + z = 2

αx + (1 + β)y + z = 3

αx + βy + 2z = 2

has a unique solution is

a) (-4, 2)

b) (1, -3)

c) (-3, 1)

d) (2, 4)

73. If |A| $\neq$ 0 which of the following is not true? **[1]**

a) $A^1 = |A|^1$

b) $(A')^{-1} = (A^{-1})'$

c) $A^{-1} = |A|^{-1}$

d) $(A^2)^{-1} = (A^{-1})^2$

74. If A is square matrix of order 3 $\times$ 3 such that |A| = 2, then write the value of |adj (adj A)|. **[1]**

a) 16

b) -16

c) 0

d) 2

75. If A is a non-singular square matrix of order 3 such that A^2 = 3A, then value of |A| is **[1]**

a) 3

b) 9

c) -3

d) 27