



India's Number 1 Education App

## MATHS

### NCERT - NCERT MATHEMATICS(HINGLISH)

#### DETERMINANTS

##### Exercise 4 3

1. Find values of k if area of triangle is 4 sq. units and vertices are

- (i)  $(k, 0), (4, 0), (0, 2)$
- (ii)  $(-2, 0), (0, 4), (0, k)$



Watch Video Solution

2. Find area of the triangle with vertices at the point given in each of the following :

(i)  $(1, 0), (6, 0), (4, 3)$

(ii)  $(2, 7), (1, 1), (10, 8)$

(iii)  $(-2, -3), (3, 2), (-1, -8)$



**Watch Video Solution**

3. Show that points  $A(a, b + c), B(b, c + a), C(c, a + b)$  are collinear.



**Watch Video Solution**

4. (i) Find equation of line joining  $(1,2)$  and  $(3,6)$  using determinants,

(ii) Find equation of line joining  $(3, 1)$  and  $(9,3)$  using determinants.



**Watch Video Solution**

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

- (A) 12 (B) –2 (C) 12, 2 (D) 12, 2



**Watch Video Solution**

## Exercise 4 2

1. Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$$



**Watch Video Solution**

2. Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$$



**Watch Video Solution**

**3.** Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} b+c & q+r & y+z \\ c+a & r+p & z+x \\ a+b & p+q & x+y \end{vmatrix} = 2 \begin{vmatrix} a & p & x \\ b & q & y \\ c & r & z \end{vmatrix}$$



**Watch Video Solution**

**4.** Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0$$



**Watch Video Solution**

**5.** Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} 2 & 7 & 65 \\ 3 & 8 & 75 \\ 4 & 9 & 86 \end{vmatrix} = 0$$



**Watch Video Solution**

**6.** Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = 0$$



**Watch Video Solution**

**7.** Using the property of determinants and without expanding, prove

that: 
$$\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+c \end{vmatrix} = 0$$



**Watch Video Solution**

**8.** By using properties of determinants. Show that:

$$\begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$



**Watch Video Solution**

**9.** By using properties of determinants. Show that:

$$(i) \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$$

$$(ii) \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a - b)(b - c)(c - a)(a + b + c)$$



**Watch Video Solution**

**10.** By using properties of determinants. Show that:

$$(i) \begin{vmatrix} x + 4 & 2x & 2x \\ 2x & x + 4 & 2x \\ 2x & 2x & x + 4 \end{vmatrix} = (5x - 4)(4 - x)^2$$

$$(ii) \begin{vmatrix} y + k & y & y \\ y & y + k & y \\ y & y & y + k \end{vmatrix} = k^2(3y + k)$$



**Watch Video Solution**

**11.** By using properties of determinants. Show that:

$$(i) \begin{vmatrix} a - b - c & 2a & 2a \\ 2b & b - c - a & 2b \\ 2c & 2c & c - a - b \end{vmatrix} = (a + b + c)^3$$

$$(ii) \begin{vmatrix} x + y + 2z & x & y \\ z & y + z + 2x & y \\ z & x & z + x + 2y \end{vmatrix} = 2(x + y + z)^3$$



**Watch Video Solution**

**12.** By using properties of determinants. Show that:

$$\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = (1 - x^3)^2$$



**Watch Video Solution**

**13.** By using properties of determinants. Show that:

$$\begin{vmatrix} 1 + a^2 - b^2 & 2ab & -2b \\ 2ab & 1 - a^2 + b^2 & 2a \\ 2b & -2a & 1 - a^2 - b^2 \end{vmatrix} = (1 + a^2 + b^2)^3$$



**Watch Video Solution**

14. By using properties of determinants. Show that:

$$\begin{vmatrix} a^2 + 1 & ab & ac \\ ab & b^2 + 1 & bc \\ ca & cb & c^2 + 1 \end{vmatrix} = (1 + a^2 + b^2 + c^2)$$



Watch Video Solution

15. Let A be a square matrix of order  $3 \times 3$ , then  $|kA|$  is equal to

- (A)  $k|A|$  (B)  $k^2|A|$  (C)  $K^3|A|$  (D)  $3k|A|$



Watch Video Solution

16. Which of the following is correct

- (A) Determinant is a square matrix.
- (B) Determinant is a number associated to a matrix.
- (C) Determinant is a number associated to a square matrix.
- (D) None of these



Watch Video Solution

## Exercise 4 5

1. For the matrix  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & 1 & 3 \end{bmatrix}$ . Show that  $A^3 - 6A^2 + 5A + 11I = 0$ . Hence, find  $A^{-1}$ .



Watch Video Solution

2. For the matrix  $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$ , find the numbers a and b such that  $A^2 + aA + bI = O$ .



Watch Video Solution

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

(B)  $\frac{1}{\det(A)}$

(C) 1

(D) 0



Watch Video Solution

4. Find the inverse the matrix (if it exists)given in  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos \alpha & \sin \alpha \\ 0 & \sin \alpha & -\cos \alpha \end{bmatrix}$



Watch Video Solution

5. Let  $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$ . Verify that  $(AB)^{-1} = B^{-1}A^{-1}$



Watch Video Solution

6. Let A be a non-singular square matrix of order  $3 \times 3$ . Then  $|\text{adj } A|$  is equal to

- (A)  $|A|$  (B)  $|A|^2$  (C)  $|A|^3$  (D)  $3|A|$



[Watch Video Solution](#)

7. If  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ . Verify that  $A^3 - 6A^2 + 9A - 4I = 0$  and hence find  $A^{-1}$ .



[Watch Video Solution](#)

8. Find the inverse the matrix (if it exists) given in  $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$



[Watch Video Solution](#)

9. Find the inverse the matrix (if it exists) given in

$$\begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$$


[Watch Video Solution](#)

10. Find adjoint of the matrice in

$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{bmatrix}$$


[Watch Video Solution](#)

11. Verify  $A(adjA) = (adjA)A = |A|I$  where  $A = \begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$



[Watch Video Solution](#)

12. Find adjoint of the matrice in

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


[Watch Video Solution](#)

13. Find the inverse the matrix (if it exists)given in  $\begin{bmatrix} -1 & 5 \\ -3 & 2 \end{bmatrix}$

 Watch Video Solution

14. Find the inverse the matrix (if it exists)given in  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & 5 \end{bmatrix}$

 Watch Video Solution

15. Verify  $A(\text{adj}A) = (\text{adj}A)A = |A|I$

$$\begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{bmatrix}$$

 Watch Video Solution

16. Find the inverse the matrix (if it exists)given in  $\begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$

 Watch Video Solution

17. Find the inverse the matrix (if it exists) given in  $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$



[Watch Video Solution](#)

18. If  $A = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$ , show that  $A^2 - 5A + 5I = 0$ . Hence, find  $A^{-1}$ .



[Watch Video Solution](#)

## Exercise 4 1

1. If  $A = \begin{bmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{bmatrix}$ . Find  $|A|$ .



[Watch Video Solution](#)

2. Find values of  $x$ , if (i)  $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} - \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$  (ii)  $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} - \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$



Watch Video Solution

3. If  $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$ , then show that  $|3A| = 27|A|$



Watch Video Solution

4. Evaluate the determinants

(i)  $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$  (ii)  $\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$  (iii)  $\begin{vmatrix} 0 & 1 & 2 \\ -1 & 0 & -3 \\ -2 & 3 & 0 \end{vmatrix}$  (iv)

$\begin{vmatrix} 2 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{vmatrix}$



Watch Video Solution

5. Evaluate the determinants in(i)  $\begin{vmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{vmatrix}$  (ii)

$$\begin{vmatrix} x^2 - x + 1 & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$$



[Watch Video Solution](#)

6. If  $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$ , then show that  $|2A| = 4|A|$



[Watch Video Solution](#)

7. Evaluate the determinants  $\begin{vmatrix} 2 & 4 \\ -5 & -1 \end{vmatrix}$



[Watch Video Solution](#)

8. If  $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$ , then x is equal to (A) 6 (B)  $\pm 6$  (C) -6 (D) 0



[Watch Video Solution](#)

## Exercise 4 6

1. Solve system of linear equations, using matrix method,

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

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

$$3x - y - 2z = 3$$



[Watch Video Solution](#)

2. Examine the consistency of the system of equations

$$x + 2y = 2 \quad 2x + 3y = 3$$



[Watch Video Solution](#)

3. Solve system of linear equations, using matrix method,

$$5x + 2y = 4, \quad 7x + 3y = 5$$



[Watch Video Solution](#)

**4.** Examine the consistency of the system of equations

$$5x - y + 4z = 5, \quad 2x + 3y + 5z = 2, \quad 5x - 2y + 6z = 1$$



**Watch Video Solution**

**5.** Examine the consistency of the system of equations

$$3x - y - 2z = 2 \quad 2y - z = 1 \quad 3x - 5y = 3$$



**Watch Video Solution**

**6.** Examine the consistency of the system of equations

$$x + y + z = 1, 2x + 3y + 2z = 2, ax + ay + 2az = 4$$



**Watch Video Solution**

7. If  $A = \begin{pmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{pmatrix}$  find  $A^{-1}$ . Use it to solve the system of equations

$$2x - 3y + 5z = 11, 3x + 2y - 4z = -5 \text{ and } x + y - 2z = -3$$



[Watch Video Solution](#)

8. Solve system of linear equations, using matrix method,

$$5x + 2y = 3 \quad 3x + 2y = 5$$



[Watch Video Solution](#)

9. Solve system of linear equations, using matrix method,

$$2x + y + z = 1 \quad x - 2y - z = \frac{3}{2} \quad 3y - 5z = 9$$



[Watch Video Solution](#)

**10.** Solve system of linear equations, using matrix method,

$$x - y + z = 4 \quad 2x + y - 3z = 0 \quad x + y + z = 2$$



**Watch Video Solution**

**11.** Solve system of linear equations, using matrix method,

$$4x - 3y = 3 \quad 3x - 5y = 7$$



**Watch Video Solution**

**12.** Solve system of linear equations, using matrix method,

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



**Watch Video Solution**

**13.** Examine the consistency of the system of equations

$$x + 3y = 5 \quad 2x + 6y = 8$$



Watch Video Solution

14. Examine the consistency of the system of equations

$$2x - y = 5 \quad x + y = 4$$



Watch Video Solution

15. The cost of 4 kg onion, 3 kg wheat and 2 kg rice is Rs 60. The cost of 2 kg onion, 4 kg wheat and 6 kg rice is Rs 90. The cost of 6 kg onion 2 kg wheat and 3 kg rice is Rs 70. Find cost of each item per kg by matrix method.



Watch Video Solution

Solved Examples

1. Evaluate  $\begin{vmatrix} 2 & 4 \\ -1 & 2 \end{vmatrix}$



Watch Video Solution

2. Evaluate the determinant  $\Delta = \begin{vmatrix} 1 & 2 & 4 \\ -1 & 3 & 0 \\ 4 & 1 & 0 \end{vmatrix}$



Watch Video Solution

3. Evaluate  $\begin{vmatrix} x & x + 1 \\ x - 1 & x \end{vmatrix}$



Watch Video Solution

4. Find values of  $x$  for which  $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

A.  $x = \pm 2\sqrt{2}$

B.  $x = \pm 2\sqrt{3}$

C.  $x = \pm 5\sqrt{2}$

D.  $x = \pm 2\sqrt{7}$

**Answer: A**



**Watch Video Solution**

5. Evaluate  $\Delta = \begin{vmatrix} 0 & \sin \alpha & -\cos \alpha \\ -\sin \alpha & 0 & \sin \beta \\ \cos \alpha & -\sin \beta & 0 \end{vmatrix}$



**Watch Video Solution**

6. Verify Property 2 for  $\Delta = \begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$



**Watch Video Solution**

7. Verify Property 1 for  $\Delta = \begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$



Watch Video Solution

8. Write the value of the following determinant:  $\begin{vmatrix} 102 & 18 & 36 \\ 1 & 3 & 4 \\ 17 & 3 & 6 \end{vmatrix}$



Watch Video Solution

9. Evaluate  $\Delta = \begin{vmatrix} 3 & 2 & 3 \\ 2 & 2 & 3 \\ 3 & 2 & 3 \end{vmatrix}$



Watch Video Solution

10. Without expanding, prove that  $\Delta = \begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix} = 0$



Watch Video Solution

11. Evaluate  $\Delta = |1abc1bca1cab|$



Watch Video Solution

12. Show that  $\begin{vmatrix} a & b & c \\ a + 2x & b + 2y & c + 2z \\ x & y & z \end{vmatrix} = 0$



Watch Video Solution

13. Prove that  $\begin{vmatrix} a & a + b & a + b + c \\ 2a & 3a + 2b & 4a + 3b + 2c \\ 3a & 6a + 3b & 10a + 6b + 3c \end{vmatrix} = a^3$



Watch Video Solution

**14.**

Show

that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( 1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right) = abc + bc + ca + ab$$



**Watch Video Solution**

**15.** Find the area of the triangle whose vertices are  $(3, 8)$ ,  $(-4, 2)$  and  $(5, 1)$ .



**Watch Video Solution**

**16.** Prove that  $|b + caabc + aba + b| = 4abc$



**Watch Video Solution**

17. If  $x, y, z$  are different and  $\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ , then show

that  $1+xyz=0$



**Watch Video Solution**

18. Find the equation of the line joining A( 1,3) and B (0,0) using determinants and find k if D(k, 0) is a point such that area of triangle ABD is 3sq units.



**Watch Video Solution**

19. Find the minor of element 6 in the determinant  $\Delta = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$



**Watch Video Solution**

**20.** The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.



**Watch Video Solution**

**21.** Solve the following system of equations by matrix method.

$$3x - 2y + 3z = 8$$

$$2x + y - z = 1$$

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



**Watch Video Solution**

**22.** Solve the system of equations  $2x + 5y = 1$  and  $3x + 2y = 7$ .



**Watch Video Solution**

23. Show that the matrix  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  satisfies the equation  $A^2 - 4A + I = 0$



[Watch Video Solution](#)

24. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ , then verify that  $(AB)^{-1} = B^{-1}A^{-1}$



[Watch Video Solution](#)

25. If  $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ , then verify that  $AadjA = |A|I$ . Also find  $A^{-1}$ .



[Watch Video Solution](#)

26. Find adj for  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$



[Watch Video Solution](#)



27. Find minors and cofactors of the elements of the determinant

$$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$$
 and verify that  $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33} = 0$



Watch Video Solution

28. Find minors and cofactors of the elements  $a_{11}, a_{21}$  in the

$$\text{determinant } \Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{23} \end{vmatrix}$$



Watch Video Solution

29. Find minors and cofactors of all the elements of the determinant

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



Watch Video Solution

**30.** If  $a, b, c$  are positive and unequal, show that value of the determinant  $\Delta = |abcbcacab|$  is negative.



**Watch Video Solution**

**31.** If  $a, b, c$  are in A.P, find value of

$$\begin{vmatrix} 2y + 4 & 5y + 7 & 8y + a \\ 3y + 5 & 6y + 8 & 9y + b \\ 4y + 6 & 7y + 9 & 10y + c \end{vmatrix}$$



**Watch Video Solution**

**32.** Show that

$$\Delta = \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3.$$



**Watch Video Solution**

**33.** Use product  $[1 - 1202 - 33 - 24][ - 20192 - 361 - 2]$  to solve the system of equations

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


**Watch Video Solution**

**34.** Prove that  $\Delta = \begin{vmatrix} a + bx & c + dx & p + qx \\ ax + b & cx + d & px + q \\ u & v & w \end{vmatrix} = (1 - x^2) \begin{vmatrix} a & c & p \\ b & d & q \\ u & c & w \end{vmatrix}$



**Watch Video Solution**

## Miscellaneous Exercise

**1.** Let  $A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}$ , where  $0 \leq \theta \leq 2\pi$ . Then

(A)  $\text{Det}(A) = 0$

(B)  $\text{Det}(A) \in (2, \infty)$

(C)  $\text{Det}(A) \in (2, 4)$

(D)  $\text{Det}(A) \in [2, 4]$



Watch Video Solution

2. If  $x, y, z$  are non-zero real numbers, then the inverse of matrix

$$A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix} \text{ is}$$

$$(A) \begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$$

$$(B) xyz \begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$$

$$(C) \frac{1}{xyz} \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$$

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



Watch Video Solution

3. If  $a, b, c$ , are in A.P, then the determinant  $\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix}$  is

- (A) 0 (B) 1 (C)  $x$  (D)  $2x$



[Watch Video Solution](#)

4. Solve the system of equations

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4$$

$$\frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1$$

$$\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$$



[Watch Video Solution](#)

5. Using properties of determinants. Prove that

$$\begin{vmatrix} \sin \alpha & \cos \alpha & \cos(\alpha + \delta) \\ \sin \beta & \cos \beta & \cos(\beta + \delta) \\ \sin \gamma & \cos \gamma & \cos(\gamma + \delta) \end{vmatrix} = 0$$



[Watch Video Solution](#)

6. Using properties of determinants. Prove that

$$\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 4+3p+2q \\ 3 & 6+3p & 10+6p+3q \end{vmatrix} = 1$$



[Watch Video Solution](#)

7. Using properties of determinants. Prove that

$$\begin{vmatrix} 3a & -a+b & -a+c \\ -b+a & 3b & -b+c \\ -c+a & -c+b & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$$



[Watch Video Solution](#)

8. Using properties of determinants. Prove that

$$\begin{vmatrix} x & x^2 & 1+px^3 \\ y & y^2 & 1+py^3 \\ z & z^2 & 1+pz^3 \end{vmatrix} = (1+pxyz)(x-y)(y-z)(z-x), \text{ where } p \text{ is}$$

any scalar.



[Watch Video Solution](#)

9. Using properties of determinants. Prove that

$$\begin{vmatrix} \alpha & \alpha^2 & \beta + \gamma \\ \beta & \beta^2 & \gamma + \alpha \\ \gamma & \gamma^2 & \alpha + \beta \end{vmatrix} = (\beta - \gamma)(\gamma - \alpha)(\alpha - \beta)(\alpha + \beta + \gamma)$$



Watch Video Solution

10. Evaluate

$$\begin{vmatrix} 1 & x & y \\ 1 & x + y & y \\ 1 & x & x + y \end{vmatrix}$$



Watch Video Solution

11. Let  $A = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 3 & 1 \\ 1 & 1 & 5 \end{bmatrix}$ . Verify that (i)

$$[adj A]^{-1} = adj(A^{-1})$$

$$(ii) A^{(-1)^{-1}} = A$$



Watch Video Solution

12. Evaluate  $\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix}.$



Watch Video Solution

13. Without expanding the determinant, prove that

$$\begin{vmatrix} a & a^2 & bc \\ b & b^2 & ca \\ c & c^2 & ab \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$$



Watch Video Solution

14. Evaluate  $\begin{vmatrix} \cos \alpha \cos \beta & \cos \alpha \sin \beta & -\sin \alpha \\ -\sin \beta & \cos \beta & 0 \\ \sin \alpha \cos \beta & \sin \alpha \sin \beta & \cos \alpha \end{vmatrix}$



Watch Video Solution

15. If  $a$ ,  $b$  and  $c$  are real numbers, and  $\Delta = \begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$

. Show that either  $a + b + c = 0$  or  $a = b = c$



[Watch Video Solution](#)

16. Solve the equation  $\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} = 0, a \neq 0$



[Watch Video Solution](#)

17. Prove that  $\begin{vmatrix} a^2 & bc & ac + c^2 \\ a^2 + ab & b^2 & ac \\ ab & b^2 + bc & c^2 \end{vmatrix} = 4a^2b^2c^2$



[Watch Video Solution](#)

18. Prove that the determinant

$$\begin{bmatrix} x & \sin \theta & \cos \theta \\ -\sin \theta & -x & 1 \\ \cos \theta & 1 & x \end{bmatrix}$$
 is

independent of  $\theta$ .



[Watch Video Solution](#)

19. If  $A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ , find  $(AB)^{-1}$ .



[Watch Video Solution](#)

#### Exercise 4 4

1. Write Minors and Cofactors of the elements of following determinants:

(i)  $\begin{vmatrix} 2 & -4 \\ 0 & 3 \end{vmatrix}$  (ii)  $\begin{vmatrix} a & c \\ b & d \end{vmatrix}$



Watch Video Solution

2. Using Cofactors of elements of second row, evaluate  $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$

A. 7

B. 8

C. 9

D. 10

**Answer: A**



Watch Video Solution

3. Write Minors and Cofactors of the elements of following determinants:

(i)  $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$  (ii)  $\begin{vmatrix} 1 & 0 & 4 \\ 3 & 5 & -1 \\ 0 & 1 & 2 \end{vmatrix}$



Watch Video Solution

4. If  $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$  and  $A_{ij}$  is cofactors of  $a_{ij}$ , then value of  $\Delta$

is given by

A.  $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$

B.  $a_{11}A_{11} + a_{12}A_{21} + a_{13}A_{31}$

C.  $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$

D.  $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$

**Answer: D**



Watch Video Solution

5. Using Cofactors of elements of third column, evaluate

$$\Delta = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$$



Watch Video Solution