

Determinants

Question 1.

Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

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

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

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

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

Answer:

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

Question 2.

Find the adjoint of the matrix A, where $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 0 \\ 2 & 4 & 3 \end{bmatrix}$

(a) $\begin{bmatrix} 15 & 6 & 1 \\ 0 & 3 & 0 \\ 10 & 0 & 5 \end{bmatrix}$

(b) $\begin{bmatrix} 15 & 6 & -15 \\ 0 & -3 & 0 \\ -10 & 0 & 5 \end{bmatrix}$

(c) $\begin{bmatrix} 15 & -1 & 5 \\ 0 & 3 & 1 \\ 10 & 1 & 5 \end{bmatrix}$

(d) None of these

Answer:

(b) $\begin{bmatrix} 15 & 6 & -15 \\ 0 & -3 & 0 \\ -10 & 0 & 5 \end{bmatrix}$

Question 3.

Find x, if $\begin{bmatrix} 1 & 2 & x \\ 1 & 1 & 1 \\ 2 & 1 & -1 \end{bmatrix}$ is singular

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Answer:

- (d) 4

Question 4.

Find the value of x for which the matrix $A = \begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$ is singular.

- (a) 0, 1
- (b) 1, 3
- (c) 0, 3
- (d) 3, 2

Answer:

- (c) 0, 3

Question 5.

If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix, then x is

- | | |
|---------------------|----------------------|
| (a) $\frac{13}{25}$ | (b) $-\frac{25}{13}$ |
| (c) $\frac{5}{13}$ | (d) $\frac{25}{13}$ |

Answer:

- (b) $-\frac{25}{13}$

Question 6.

The area of a triangle with vertices $(-3, 0)$, $(3, 0)$ and $(0, k)$ is 9 sq. units. The value of k will be

- (a) 9
- (b) 3
- (c) -9
- (d) 6

Answer:

- (b) 3

Question 7.

The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$ is

- (a) 0
- (b) 2
- (c) 1
- (d) 3

Answer:

- (c) 1

Question 8.

Let $f(t) = \begin{vmatrix} \cos t & t & 1 \\ 2\sin t & t & 2t \\ \sin t & t & t \end{vmatrix}$, then $\lim_{t \rightarrow 0} \frac{f(t)}{t^2}$ is equal to

- (a) 0
- (b) -1
- (c) 2
- (d) 3

Answer:

- (a) 0

Question 9.

The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 + \sin \theta & 1 \\ 1 + \cos \theta & 1 & 1 \end{vmatrix}$ is (θ is real number)

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

(b) $\frac{\sqrt{3}}{2}$

(c) $\sqrt{2}$

(d) $\frac{2\sqrt{3}}{4}$

Answer:

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

Question 10.

The value of the determinant $\begin{vmatrix} x & x + y & x + 2y \\ x + 2y & x & x + y \\ x + y & x + 2y & x \end{vmatrix}$ is

(a) $9x^2(x + y)$

(b) $9y^2(x + y)$

(c) $3y^2(x + y)$

(d) $7x^2(x + y)$

Answer:

(b) $9y^2(x + y)$

Question 11.

For what value of x , matrix $\begin{bmatrix} 6 - x & 4 \\ 3 - x & 1 \end{bmatrix}$ is a singular matrix?

(a) 1

(b) 2

(c) -1

(d) -2

Answer:

(b) 2

Question 12.

Compute $(AB)^{-1}$, If

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \text{ and } B^{-1} = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & -1 \\ 1 & 0 & 2 \end{bmatrix}$$

$$(a) \frac{1}{19} \begin{bmatrix} 16 & 12 & 1 \\ 21 & 11 & -7 \\ 10 & -2 & 3 \end{bmatrix} \quad (b) \frac{1}{19} \begin{bmatrix} 16 & 12 & 10 \\ 21 & 11 & -2 \\ 1 & -7 & 3 \end{bmatrix}$$

$$(c) \frac{1}{19} \begin{bmatrix} 16 & 12 & 1 \\ -21 & -11 & 7 \\ 10 & -2 & 3 \end{bmatrix} \quad (d) \frac{1}{19} \begin{bmatrix} 16 & -21 & 1 \\ 21 & 11 & 7 \\ 10 & -2 & 3 \end{bmatrix}$$

Answer:

$$(a) \frac{1}{19} \begin{bmatrix} 16 & 12 & 1 \\ 21 & 11 & -7 \\ 10 & -2 & 3 \end{bmatrix}$$

Question 13.

$$\text{If } A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \text{ then } \frac{A^2 - 3I}{2} =$$

- (a) A^{-1} (b) $2A$
 (c) $2A^{-1}$ (d) $\frac{3}{2}A^{-1}$

Answer:

$$(a) A^{-1}$$

Question 14.

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

- (a) $\frac{1}{11} \begin{bmatrix} 14 & 5 \\ 5 & 1 \end{bmatrix}$ (b) $\frac{1}{11} \begin{bmatrix} 14 & -5 \\ -5 & 1 \end{bmatrix}$
(c) $\frac{1}{11} \begin{bmatrix} 1 & 5 \\ 5 & 14 \end{bmatrix}$ (d) $\frac{1}{11} \begin{bmatrix} 1 & -5 \\ -5 & 14 \end{bmatrix}$

Answer:

(a) $\frac{1}{11} \begin{bmatrix} 14 & 5 \\ 5 & 1 \end{bmatrix}$

Question 15.

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

- (a) $\frac{1}{17} \begin{bmatrix} 2 & 3 \\ -3 & 4 \end{bmatrix}$ (b) $\frac{1}{17} \begin{bmatrix} 4 & 3 \\ -3 & 2 \end{bmatrix}$
(c) $\frac{-1}{17} \begin{bmatrix} 4 & 3 \\ -3 & 2 \end{bmatrix}$ (d) $\frac{1}{17} \begin{bmatrix} 4 & 3 \\ -3 & -2 \end{bmatrix}$

Answer:

(b) $\frac{1}{17} \begin{bmatrix} 4 & 3 \\ -3 & 2 \end{bmatrix}$

Question 16.

If the points $(3, -2)$, $(x, 2)$, $(8, 8)$ are collinear, then find the value of x .

- (a) 2
(b) 3
(c) 4
(d) 5

Answer:

- (d) 5

Question 17.

Using determinants, find the equation of the line joining the points $(1, 2)$ and $(3, 6)$.

- (a) $y = 2x$
- (b) $x = 3y$
- (c) $y = x$
- (d) $4x - y = 5$

Answer:

- (a) $y = 2x$

Question 18.

Find the minor of the element of second row and third column in the following determinant

$$\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$$

- (a) 13
- (b) 4
- (c) 5
- (d) 0

Answer:

- (a) 13

Question 19.

If $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, then write the minor of the element a_{23} .

- (a) 7
- (b) -7
- (c) 4
- (d) 8

Answer:

- (a) 7

Question 20.

If a, b, c are the roots of the equation $x^3 - 3x^2 + 3x + 7 = 0$, then the value of

$$\begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} \text{ is}$$

- (a) 9
- (b) 27
- (c) 81
- (d) 0

Answer:

- (d) 0

Question 21.

If $\begin{vmatrix} 1 + a^2x & (1 + b^2)x & (1 + c^2)x \\ (1 + a^2)x & 1 + b^2x & (1 + c^2)x \\ (1 + a^2)x & (1 + b^2)x & 1 + c^2x \end{vmatrix}$, then $f(x)$ is a polynomial of degree

- (a) 2
- (b) 3
- (c) 0
- (d) 1

Answer:

- (a) 2

Question 22.

$\begin{vmatrix} a^2 & 2ab & b^2 \\ b^2 & a^2 & 2ab \\ 2ab & b^2 & a^2 \end{vmatrix}$ is equal to

- (a) $a^3 - b^3$
- (b) $a^3 + b^3$
- (c) $(a^3 - b^3)^2$
- (d) $(a^3 + b^3)^2$

Answer:

- (d) $(a^3 + b^3)^2$

Question 23.

If α, β, γ are in A.P., then $\begin{vmatrix} x - 3 & x - 4 & x - \alpha \\ x - 2 & x - 3 & x - \beta \\ x - 1 & x - 2 & x - \gamma \end{vmatrix} =$

- (a) 0
- (b) $(x - 2)(x - 3)(x - 4)$
- (c) $(x - \alpha)(x - \beta)(x - \gamma)$
- (d) $\alpha\beta\gamma(\alpha - \beta)(\beta - \gamma)^2$

Answer:

- (a) 0

Question 24.

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

- (a) $-(a - b)(b - c)(c - a)(a^2 + b^2 + c^2)$

(b) $(a - b)(b - c)(c - a)$

(c) $(a^2 + b^2 + c^2)$

(d) $(a - b)(b - c)(c - a)(a^2 + b^2 + c^2)$

Answer:

(a) $-(a - b)(b - c)(c - a)(a^2 + b^2 + c^2)$

Question 25.

Evaluate the determinant $\Delta = \begin{vmatrix} \log_3 512 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix}$

(a) $\frac{15}{2}$

(b) 12

(c) $\frac{14}{3}$

(d) 6

Answer:

(a) $\frac{15}{2}$

Question 26.

$\begin{vmatrix} x & -7 \\ x & 5x + 1 \end{vmatrix}$

(a) $3x^2 + 4$

(b) $x(5x + 8)$

(c) $3x + 4x^2$

(d) $x(3x + 4)$

Answer:

(b) $x(5x + 8)$

Question 27.

$\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$

(a) 0

(b) 5

(c) 3

(d) 7

Answer:

(a) 0

Question 28.

If $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = k(a+b+c)^3$, then

k is

- (a) 0 (b) 1
(c) 2 (d) 3

Answer:

(b) 1

Question 29.

If $abc \neq 0$ and $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = 0$, then $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} =$

- (a) 1 (b) 2
(c) -1 (d) -3

Answer:

(c) -1

Question 30.

Find a 2×2 matrix B such that $B = \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$

- (a) $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$
(c) $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -2 \\ -1 & 4 \end{bmatrix}$

Answer:

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

Question 31.

If for the non-singular matrix A, $A^2 = I$, then find A^{-1} .

- (a) A
(b) I
(c) O

(d) None of these

Answer:

(a) A

Question 32.

If the equation $a(y + z) = x$, $b(z + x) = y$, $c(x + y) = z$ have non-trivial solutions then the value of $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$ is

(a) 1

(b) 2

(c) -1

(d) -2

Answer:

(b) 2

Question 33.

A non-trivial solution of the system of equations $x + \lambda y + 2z = 0$, $2x + \lambda z = 0$, $2\lambda x - 2y + 3z = 0$ is given by $x : y : z =$

(a) 1 : 2 : -2

(b) 1 : -2 : 2

(c) 2 : 1 : 2

(d) 2 : 1 : -2

Answer:

(d) 2 : 1 : -2

Question 34.

If $4x + 3y + 6z = 25$, $x + 5y + 7z = 13$, $2x + 9y + z = 1$, then $z =$ _____

(a) 1

(b) 3

(c) -2

(d) 2

Answer:

(d) 2

Question 35.

If the equations $2x + 3y + z = 0$, $3x + y - 2z = 0$ and $ax + 2y - bz = 0$ has non-trivial solution, then

(a) $a - b = 2$

(b) $a + b + 1 = 0$

(c) $a + b = 3$

(d) $a - b - 8 = 0$

Answer:

(a) $a - b = 2$

Question 36.

Solve the following system of equations $x - y + z = 4$, $x - 2y + 2z = 9$ and $2x + y + 3z = 1$.

- (a) $x = -4, y = -3, z = 2$
- (b) $x = -1, y = -3, z = 2$
- (c) $x = 2, y = 4, z = 6$
- (d) $x = 3, y = 6, z = 9$

Answer:

- (b) $x = -1, y = -3, z = 2$

Question 37.

If the system of equations $x + ky - z = 0$, $3x - ky - z = 0$ & $x - 3y + z = 0$ has non-zero solution, then k is equal to

- (a) -1
- (b) 0
- (c) 1
- (d) 2

Answer:

- (c) 1

Question 38.

If the system of equations $2x + 3y + 5 = 0$, $x + ky + 5 = 0$, $kx - 12y - 14 = 0$ has non-trivial solution, then the value of k is

- (a) $-2, \frac{12}{5}$
- (b) $-1, \frac{1}{5}$
- (c) $-6, \frac{17}{5}$
- (d) $6, -\frac{12}{5}$

Answer:

- (c) $-6, \frac{17}{5}$

Question 39.

If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then the value of x is

- (a) 3
- (b) ± 3
- (c) ± 6
- (d) 6

Answer:

- (c) ± 6

Question 40.

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

- (a) $(a-b)(b-c)(c-a)(a^2 + b^2 + c^2)$
- (b) $-(a-b)(b-c)(c-a)$
- (c) $(a-b)(b-c)(c-a)(a+b+c)(a^2 + b^2 + c^2)$
- (d) 0

Answer:

- (c) $(a-b)(b-c)(c-a)(a+b+c)(a^2 + b^2 + c^2)$

Question 41.

Find the area of the triangle with vertices P(4, 5), Q(4, -2) and R(-6, 2).

- (a) 21 sq. units
- (b) 35 sq. units
- (c) 30 sq. units
- (d) 40 sq. units

Answer:

- (b) 35 sq. units

Question 42.

If the points (a_1, b_1) , (a_2, b_2) and $(a_1 + a_2, b_1 + b_2)$ are collinear, then

- (a) $a_1 b_2 = a_2 b_1$
- (b) $a_1 + a_2 = b_1 + b_2$
- (c) $a_2 b_2 = a_1 b_1$
- (d) $a_1 + b_1 = a_2 + b_2$

Answer:

- (a) $a_1 b_2 = a_2 b_1$

Question 43.

If the points (2, -3), (k, -1) and (0, 4) are collinear, then find the value of 4k.

- (a) 4
- (b) 7/140
- (c) 47
- (d) 40/7

Answer:

- (d) 40/7

Question 44.

Find the area of the triangle whose vertices are (-2, 6), (3, -6) and (1, 5).

- (a) 30 sq. units
- (b) 35 sq. units
- (c) 40 sq. units
- (d) 15.5 sq. units

Answer:

- (d) 15.5 sq. units

Question 45.

$$\begin{vmatrix} 2xy & x^2 & y^2 \\ x^2 & y^2 & 2xy \\ y^2 & 2xy & x^2 \end{vmatrix} =$$

- (a) $(x^3 + y^3)^2$
- (b) $(x^2 + y^2)^3$
- (c) $-(x^2 + y^2)^3$
- (d) $-(x^3 + y^3)^2$

Answer:

- (d) $-(x^3 + y^3)^2$

Question 46.

The value of $\begin{vmatrix} \cos(\alpha + \beta) & -\sin(\alpha + \beta) & \cos 2\beta \\ \sin \alpha & \cos \alpha & \sin \beta \\ -\cos \alpha & \sin \alpha & \cos \beta \end{vmatrix}$ is independent of

- (a) α
- (b) β
- (c) α, β
- (d) none of these

Answer:

- (a) α

Question 47.

Let $\Delta = \begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix}$, then the value of Δ is

- (a) $(x - y)(y - z)(z - x)$
- (b) xyz
- (c) $(x^2 + y^2 + z^2)^2$
- (d) $xyz(x - y)(y - z)(z - x)$

Answer:

- (d) $xyz(x - y)(y - z)(z - x)$

Question 48.

The value of the determinant $\begin{vmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta + \gamma & \gamma + \alpha & \alpha + \beta \end{vmatrix} =$

- (a) $(\alpha + \beta)(\beta + \gamma)(\gamma + \alpha)$
- (b) $(\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)(\alpha + \beta + \gamma)$
- (c) $(\alpha + \beta + \gamma)^2 (\alpha - \beta - \gamma)^2$
- (d) $\alpha\beta\gamma (\alpha + \beta + \gamma)$

Answer:

- (b) $(\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)(\alpha + \beta + \gamma)$

Question 49.

Using properties of determinants, $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} =$

- (a) 0
- (b) 1
- (c) 2
- (d) 3

Answer:

- (a) 0

Question 50.

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

- (a) 6, 6
- (b) 6, -6
- (c) -6, -6
- (d) -6, 6

Answer:

- (d) -6, 6