

Matrices

Question 1.

If A and B are symmetric matrices of the same order, then

- (a) AB is a symmetric matrix
- (b) A – B is askew-symmetric matrix
- (c) AB + BA is a symmetric matrix
- (d) AB – BA is a symmetric matrix

Answer:

- (c) AB + BA is a symmetric matrix

Question 2.

If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then x =

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

Answer:

- (c) -4

Question 3.

If A is a square matrix, then $A - A'$ is a

- (a) diagonal matrix
- (b) skew-symmetric matrix
- (c) symmetric matrix
- (d) none of these

Answer:

- (b) skew-symmetric matrix

Question 4.

If A is any square matrix, then which of the following is skew-symmetric?

- (a) $A + A^T$
- (b) $A - A^T$
- (c) AA^T
- (d) $A^T A$

Answer:

(b) $A - A^T$

Question 5.

If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then

- (a) $\alpha = a^2 + b^2, \beta = ab$
- (b) $\alpha = a^2 + b^2, \beta = 2ab$
- (c) $\alpha = a^2 + b^2, \beta = a^2 - b^2$
- (d) $\alpha = 2ab, \beta = a^2 + b^2$

Answer:

(b) $\alpha = a^2 + b^2, \beta = 2ab$

Question 6.

If $A = \begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $AB = I_3$, then $x + y$ equals

- (a) 0
- (b) -1
- (c) 2
- (d) None of these

Answer:

(a) 0

Question 7.

If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and $f(x) = (1 + x)(1 - x)$, then $f(A)$ is

- (a) $-4 \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- (b) $-8 \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- (c) $4 \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- (d) None of these

Answer:

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

Question 8.

If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 - KA - 5I = 0$, then $K =$

- (a) 5
- (b) 3
- (c) 7
- (d) None of these

Answer:

- (a) 5

Question 9.

If $A = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$, then $(AB)^T$ is equal

to

- (a) $\begin{bmatrix} -3 & -2 \\ 10 & 7 \end{bmatrix}$
- (b) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$
- (c) $\begin{bmatrix} -3 & 7 \\ 10 & 2 \end{bmatrix}$
- (d) None of these

Answer:

- (b) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$

Question 10.

If matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ where a, b, c are real positive numbers, $abc = 1$ and $A^T A = I$, then the value of $a^3 + b^3 + c^3$ is

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

Answer:

- (d) 4

Question 11.

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

(a) $\frac{1}{11} \begin{bmatrix} 1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$ (b) $\frac{1}{11} \begin{bmatrix} 1 & -2 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

(c) $\frac{1}{11} \begin{bmatrix} -1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$ (d) $\frac{1}{11} \begin{bmatrix} 1 & -3 & 5 \\ -1 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

Answer:

(c) $\frac{1}{11} \begin{bmatrix} -1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

Question 12.

Let $A = \begin{bmatrix} 1 & 2 \\ -5 & 1 \end{bmatrix}$ and $A^{-1} = xA + yI$, then the values of x and y respectively are

(a) $\frac{-1}{11}, \frac{2}{11}$ (b) $\frac{-1}{11}, \frac{-2}{11}$
(c) $\frac{1}{11}, \frac{2}{11}$ (d) $\frac{1}{11}, \frac{-2}{11}$

Answer:

(a) $\frac{-1}{11}, \frac{2}{11}$

Question 13.

Using elementary transformation, find the inverse of matrix $\begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

$$(a) \begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$$

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

$$(c) \begin{bmatrix} 2 & -1 & 1 \\ -6 & 4 & -5 \\ 5 & -4 & 3 \end{bmatrix}$$

$$(d) \begin{bmatrix} 1 & -1 & 1 \\ -6 & 4 & -5 \\ 5 & -4 & 3 \end{bmatrix}$$

Answer:

$$(a) \begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$$

Question 14.

Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$, using elementary row transformation.

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

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

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

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

Answer:

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

Question 15.

If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, then x equals

$$(a) 2$$

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

$$(c) 1$$

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

Answer:

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

Question 16.

Find the values of x, y, z respectively if the matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation

$$A^T A = I_3.$$

- (a) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{6}}, \frac{1}{\sqrt{3}}$
- (b) $\frac{-1}{\sqrt{2}}, \frac{-1}{\sqrt{6}}, \frac{-1}{\sqrt{3}}$
- (c) Both (a) and (b)
- (d) None of these

Answer:

- (c) Both (a) and (b)

Question 17.

If $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$, find AA^T .

- (a) Zero Matrix
- (b) I_2
- (c) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
- (d) None of these

Answer:

- (b) I_2

Question 18.

If $A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$, then $A + 2A^T$ equals

- (a) A
- (b) $-A^T$
- (c) A^T
- (d) $2A^2$

Answer:

- (c) A^T

Question 19.

For any square matrix A , AA^T is a

- (a) unit matrix
- (b) symmetric matrix
- (c) skew-symmetric matrix

(d) diagonal matrix

Answer:

(b) symmetric matrix

Question 20.

If $A = \begin{bmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{bmatrix}$ is the sum of a symmetric matrix B and skew-symmetric matrix C, then B is

(a) $A = \begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 7 & 5 & 1 \end{bmatrix}$

(b) $A = \begin{bmatrix} 0 & 2 & -2 \\ -2 & 5 & -2 \\ 2 & 2 & 0 \end{bmatrix}$

(c) $A = \begin{bmatrix} 6 & 6 & 7 \\ -6 & 2 & -5 \\ -7 & 5 & 1 \end{bmatrix}$

(d) $A = \begin{bmatrix} 0 & 6 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 0 \end{bmatrix}$

Answer:

(a) $A = \begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 7 & 5 & 1 \end{bmatrix}$

Question 21.

If the matrix $A = \begin{bmatrix} 5 & 2 & x \\ y & 2 & -3 \\ 4 & t & -7 \end{bmatrix}$ is a symmetric matrix, then find the value of x, y and t respectively.

(a) 4, 2, 3

(b) 4, 2, -3

(c) 4, 2, -7

(d) 2, 4, -7

Answer:

(b) 4, 2, -3

Question 22.

If a matrix A is both symmetric and skew-symmetric, then

(a) A is a diagonal matrix

(b) A is a zero matrix

(c) A is a scalar matrix

(d) A is a square matrix

Answer:

(b) A is a zero matrix

Question 23.

The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is

- (a) a skew-symmetric matrix
- (b) a symmetric matrix
- (c) a diagonal matrix
- (d) an upper triangular matrix

Answer:

- (a) a skew-symmetric matrix

Question 24.

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

- (a) $\frac{1}{13} \begin{bmatrix} -1 & 3 & -3 \\ 5 & -2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$ (b) $\frac{1}{13} \begin{bmatrix} -1 & 3 & 2 \\ -5 & 2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$
- (c) $\frac{1}{23} \begin{bmatrix} 3 & -2 & 2 \\ 5 & 2 & -5 \\ 5 & -5 & 3 \end{bmatrix}$ (d) $\frac{1}{13} \begin{bmatrix} 3 & -1 & 2 \\ 5 & 5 & -5 \\ 15 & -5 & 3 \end{bmatrix}$

Answer:

(a) $\frac{1}{13} \begin{bmatrix} -1 & 3 & -3 \\ 5 & -2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$

Question 25.

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

(a) $\begin{bmatrix} 0 & -1 & 1 \\ -2 & 3 & -4 \\ -3 & 3 & -3 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & -1 & 0 \\ -4 & 3 & -2 \\ -3 & 3 & -3 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & -1 & 1 \\ -4 & 3 & -2 \\ -3 & 3 & -2 \end{bmatrix}$

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

Answer:

(c) $\begin{bmatrix} 0 & -1 & 1 \\ -4 & 3 & -2 \\ -3 & 3 & -2 \end{bmatrix}$

Question 26.

If $A = [a_{ij}]_{4 \times 3}$ where $a_{ij} = \frac{i-j}{i+j}$, then find A

(a) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/2 & 0 & 1/5 \\ 1/3 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/3 & 0 & -1/5 \\ 1/2 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & -3 & -1/2 \\ 2 & 0 & 5 \\ 3 & 5 & 0 \\ 3/5 & 3 & 7 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 1/3 & 1/2 \\ -1/3 & 0 & 1/5 \\ -1/2 & -1/5 & 0 \\ -3/5 & -1/3 & -1/7 \end{bmatrix}$

Answer:

(b) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/3 & 0 & -1/5 \\ 1/2 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

Question 27.

The matrix $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ is a

- (a) unit matrix
- (c) symmetric matrix
- (b) diagonal matrix
- (d) skew-symmetric matrix

Answer:

- (d) skew-symmetric matrix

Question 28.

If $\begin{bmatrix} x+y & 2x+z \\ x-y & 2z+w \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 0 & 10 \end{bmatrix}$, then the values of x, y, z and w respectively are

- (a) 2, 2, 3, 4
- (b) 2, 3, 1, 2
- (c) 3, 3, 0, 1
- (d) None of these

Answer:

- (a) 2, 2, 3, 4

Question 29.

$$\begin{bmatrix} x+3 & z+4 & 2y-7 \\ 4x+6 & a-1 & 0 \\ b-3 & 3b & z+2c \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ 2x & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$$

then find the values of a, b, c, x, y, and z respectively.

- (a) -2, -7, -1, -3, -5, 2
- (b) 2, 7, 1, 3, 5, -2
- (c) 1, 3, 4, 2, 8, 9
- (d) -1, 3, -2, -7, 4, 5

Answer:

- (a) -2, -7, -1, -3, -5, 2

Question 30.

The order of the single matrix obtained from

$$\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix} \left\{ \begin{bmatrix} -1 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 1 & 23 \\ 1 & 0 & 21 \end{bmatrix} \right\} \text{ is}$$

- (a) 2×3
- (b) 2×2

(c) 3×2

(d) 3×3

Answer:

(d) 3×3

Question 31.

$A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} x & 1 \\ y & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then $x + y =$

(a) 2

(b) 3

(c) 4

(d) 5

Answer:

(d) 5

Question 32.

If $A^2 - A + I = O$, then the inverse of A is

(a) $I - A$

(b) $A - I$

(c) A

(d) $A + I$

Answer:

(a) $I - A$

Question 33.

Total number of possible matrices of order 3×3 with each entry 2 or 0 is

(a) 9

(b) 27

(c) 81

(d) 512

Answer:

(d) 512

Question 34.

The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a

(a) diagonal matrix

(b) symmetric matrix

(c) skew symmetric matrix

(d) scalar matrix

Answer:

(c) skew symmetric matrix

Question 35.

If A is a matrix of order $m \times n$ and B is a matrix such that AB' and $B'A$ are both defined, then the order of matrix B is

- (a) $m \times m$
- (b) $n \times n$
- (c) $n \times m$
- (d) $m \times n$

Answer:

- (d) $m \times n$

Question 36.

If A and B are matrices of the same order, then $(AB' - BA')$ is a

- (a) skew-symmetric matrix
- (b) null matrix
- (c) symmetric matrix
- (d) unit matrix

Answer:

- (a) skew-symmetric matrix

Question 37.

If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to

- (a) A
- (b) $I - A$
- (c) $I + A$
- (d) $3A$

Answer:

- (a) A

Question 38.

If $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$, then $A^4 - 2^4(A - I) =$

- (a) $5I + A$
- (b) $5I - A$
- (c) $5I$
- (d) $6I$

Answer:

- (b) $5I - A$

Question 39.

If A is an $m \times n$ matrix such that AB and BA are both defined, then B is a

- (a) $m \times n$ matrix
- (b) $n \times m$ matrix

- (c) $n \times n$ matrix
- (d) $m \times n$ matrix

Answer:

- (b) $n \times m$ matrix

Question 40.

If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $A^2 - 5A$ is equal to

- (a) $2I$
- (b) $3I$
- (c) $-2I$
- (d) null matrix

Answer:

- (a) $2I$

Question 41.

If $A = \begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$, then

- (a) $A + B = B + A$ and $A + (B + C) = (A + B) + C$
- (b) $A + B = B + A$ and $AC = BC$
- (c) $A + B = B + A$ and $AB = BC$
- (d) $AC = BC$ and $A = BC$

Answer:

- (a) $A + B = B + A$ and $A + (B + C) = (A + B) + C$