



# MATHS

# BOOKS - KUMAR PRAKASHAN KENDRA MATHS (GUJRATI ENGLISH)

MATRICES

#### Exercise 31

1. In the matrix  $\begin{bmatrix} 2 & 5 & 19 & -7 \\ 35 & -2 & \frac{5}{2} & 12 \\ \sqrt{3} & 1 & -5 & 17 \end{bmatrix}$  , write :

- (i) The order of the matrix ,
- (ii) The number of elements,
- (iii) Write the elements  $a_{13}, a_{21}, a_{33}, a_{24}, a_{23}$ ,

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**2.** Construct a2 imes 2 matrix , $A=ig[a_{ij}ig]$  , whose elements are given by :

(i) 
$$a_{ij} = rac{(i+j)^2}{2}$$
,  
(ii)  $a_{ij} = rac{i}{j}$   
(iii)  $a_{ij} = rac{(i+2j)^2}{2}$ 

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3. Construct a 3 imes 4 matrix , whose elements are given by :

(i) 
$$a_{ij}=rac{1}{2}|3i+j|$$

(ii) 
$$a_{ij}=2i-j$$

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4. Find the values of x, y and z from the following equations :

(i) 
$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$$
  
(ii)  $\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$   
(iii)  $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$ 

5. Find the value of a ,b,c and d from the equation :  $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}.$ 

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**6.** A 
$$= ig[ a_{ij} ig]_{m imes n}$$
 is a square matrix ,if

A. m < n

 $\mathsf{B}.\,m>n$ 

 $\mathsf{C}.\,m=n$ 

D. None of these

#### Answer: C

**7.** Which of the given values of x and y make the following pair of matrices equal

$$egin{bmatrix} 3x+7&5\ y+1&2-3x \end{bmatrix}, egin{bmatrix} 0&y-2\ 8&4 \end{bmatrix}$$
A.  $x=-rac{1}{3},y=7$ 

B. Not possible to find

C. 
$$y=7, x=-rac{2}{3}$$
  
D.  $x=-rac{1}{3}, y=-rac{2}{3}$ 

#### Answer: B

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8. The number of all possible matrices of order 3 imes3 with each entry 0 or

1 is :

A. 27

B. 18

C. 81

D. 512

Answer: D

Exercise 3 2

**1.** Let 
$$A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}, C = \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$$

Find each of the following :

(i) A+B ,(i) A-B, (iii) 3A-C,

(iv) AB, (v)BA

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2. Compute the following :

(i) 
$$\begin{bmatrix} a & b \\ -b & a \end{bmatrix} + \begin{bmatrix} a & b \\ b & a \end{bmatrix}$$

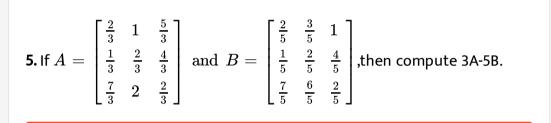
(ii) 
$$\begin{bmatrix} a^2 + b^2 & b^2 + c^2 \\ a^2 + c^2 & a^2 + b^2 \end{bmatrix} + \begin{bmatrix} 2ab & 2bc \\ -2ac & -2ab \end{bmatrix}$$
  
(iii)  $\begin{bmatrix} -1 & 4 & -6 \\ 8 & 5 & 16 \\ 2 & 8 & 5 \end{bmatrix} + \begin{bmatrix} 12 & 7 & 6 \\ 8 & 0 & 5 \\ 3 & 2 & 4 \end{bmatrix}$   
(iv)  $\begin{bmatrix} \cos^2 x & \sin^2 x \\ \sin^2 x & \cos^2 x \end{bmatrix} + \begin{bmatrix} \sin^2 x & \cos^2 x \\ \cos^2 x & \sin^2 x \end{bmatrix}$ 

(i) 
$$\begin{bmatrix} a & b \\ -b & a \end{bmatrix} \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$$
  
(ii)  $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \begin{bmatrix} 2 & 3 & 4 \end{bmatrix}$   
(iii)  $\begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$   
(iv)  $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & -3 & 5 \\ 0 & 2 & 4 \\ 3 & 0 & 5 \end{bmatrix}$   
(v)  $\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}$   
(vi)  $\begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 2 & -3 \\ 1 & 0 \\ 3 & 1 \end{bmatrix}$ 

$$\textbf{4. If } A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix} \text{ and } C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix},$$

then compute (A+B) and (B-C).Also , verify that A+(B-C) =(A+B)-C.





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6. Simplify :

$$\cos hetaiggl[ egin{array}{ccc} \cos heta&\sin heta\ -\sin heta&\cos heta \end{bmatrix}+\sin hetaiggl[ \sin heta&-\cos heta\ \cos heta&\sin heta\ \cos heta&\sin heta \end{bmatrix}$$

7. Find X and Y,if

$$X+Y=egin{bmatrix} 5&2\0&9 \end{bmatrix} ext{ and } X-Y=egin{bmatrix} 3&6\0&-1 \end{bmatrix}.$$

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**8.** Find X , if 
$$Y = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$$
 and  $2X + Y = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$ .

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**9.** Find x and y, if 
$$2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$
.

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**10.** Solve the equation for x,y,z and t, if 
$$2\begin{bmatrix} x & z \\ y & t \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}.$$

11. If 
$$x \begin{bmatrix} 2 \\ 3 \end{bmatrix} + y \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$$
, find thevalues of x and y.

**12.** Given 
$$3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$$
, find the values of

x,y,z and w.

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**13.** If 
$$F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
, show that  $F(x)F(y) = F(x+y)$ .

**14.** Show that  
(i) 
$$\begin{bmatrix} 5 & -1 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix} \neq \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & -1 \\ 6 & 7 \end{bmatrix}$$

(ii) 
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & 1 \\ 2 & 3 & 4 \end{bmatrix} \neq \begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & 1 \\ 2 & 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$
  
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**15.** Find 
$$A^2 - 5A + 6I$$
, if  $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ .

16. If 
$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$
 then , prove that  $A^3 - 6A^2 + 7A + 2I = O.$ 

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**17.** If 
$$A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$$
 and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , find k so that  $A^2 = kA - 2I$ .

**18.** If 
$$A = \begin{bmatrix} 0 & \tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$$
 and I theidentity matrix of order 2, show that  $I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$ .

**19.** A trust fund has Rs. 30,000 that must be invested in two different types of bonds . The first bond pays 5% interest per year ,and the second bond pays 7% interest per year .Using matrix multiplication , determine how to divide Rs. 30,000 among the two types of bonds . If the trust fund must obtain an annual total interest of : (a) Rs 1800 (b) Rs. 2000

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**20.** The bookshop of a particular school has 10 dozen chemistry books , 8 dozen physics books, 10 dozen economics books . Their selling prices are

Rs. 80, Rs, 60 and Rs.40 each respectively . Find the total amount the bookshop will receive from selling all the books using matrix algebra.

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**21.** Assume X, Y, Z, W and P Are Matrices of Order  $2 \times n$ ,  $3 \times k$ ,  $2 \times p$ ,  $n \times 3$  and Respectively. The restriction on n , k and p so that PY +WY will be defined are :

(A) k=3,p=n

(B) k is arbitrary, p=2

(C) p is arbitrary, k=3

(D) k=2,p=3

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**22.** Assume X, Y, Z, W and P Are Matrices of Order  $2 \ge n$ ,  $3 \ge k$ ,  $2 \ge p$ , N  $\ge 3$  and Respectively. If n =p , then the order of the matrix 7X-5Z is :

(A) p imes 2

(B) 2 imes n

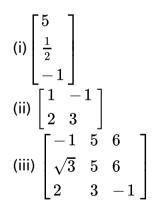
(C ) n imes 3

(D) p imes n





**1.** Find the transpose of each of the following matrices :



**2.** If 
$$A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$$
 and  $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$ , then verify that (i)

(A+B)'=A'+B'

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**3.** If 
$$A' = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$$
 and  $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$  then find (A+2B)'.

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4. For the matrices A and B , verify that (AB)'= B'A', where

(i) 
$$A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}, B = \begin{bmatrix} -1 & 2 & 1 \end{bmatrix}$$
  
(ii)  $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 5 & 7 \end{bmatrix}$ 

**5.** If (i) 
$$A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$$
 then verify that A'A=I.  
(ii)  $A = \begin{bmatrix} \sin \alpha & \cos \alpha \\ -\cos \alpha & \sin \alpha \end{bmatrix}$  then verify that A'A=I.

6. Show that the matrix 
$$A = \begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$$
 is a skew symmetric

matrix.

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7. For the matrix 
$$A = egin{bmatrix} 1 & 5 \ 6 & 7 \end{bmatrix}$$
 ,verify that

(i) (A + A) is a symmetric matrix.

(ii) (A-A) is a skew symmetric matrix.

8. Find 
$$\frac{1}{2}(A + A')$$
 and  $\frac{1}{2}(A - A)$ , when  

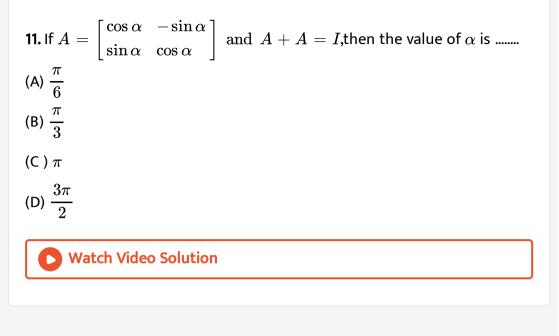
$$A = \begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix}$$
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**9.** Express the following matrices as the sum of a symmetric and a skew symmetric matrix :

(i) 
$$\begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$$
 (ii)  $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$  (iii)  $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$  (iv)  $\begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ 

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10. If A and B are symmetric matrices of same order , then AB +BA is a .....



## Exercise 3 4

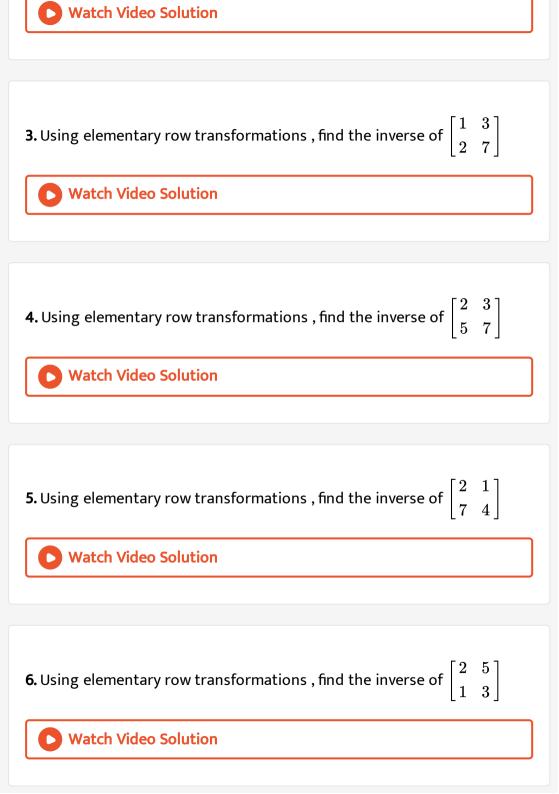
1. Using elementary row transformations, find the inverse of each of the

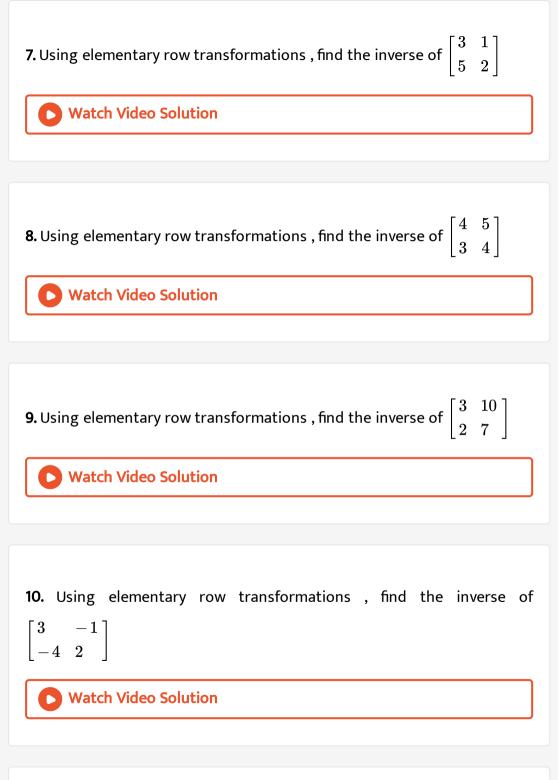
matrices, if it exists in example number.

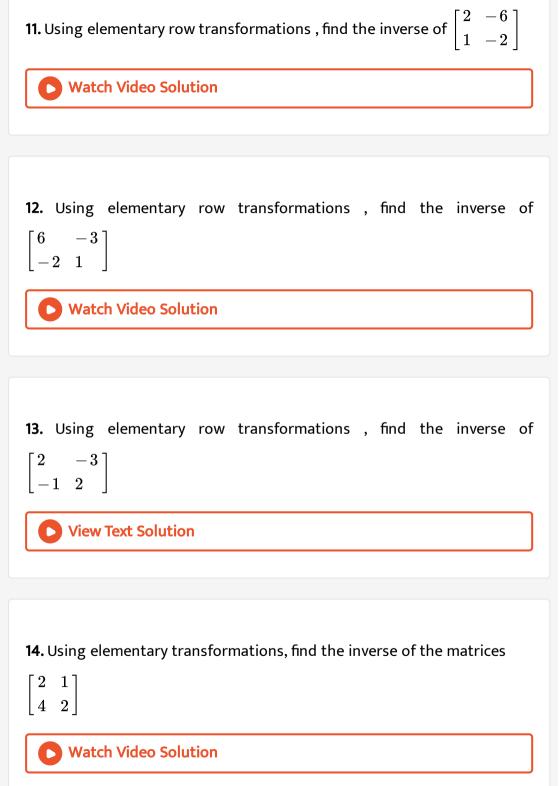
 $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ 

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**2.** Using elementary row transformations , find the inverse of  $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$ 

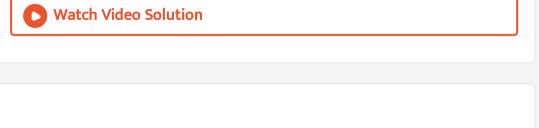






15. Using elementary transformations, find the inverse of the matrices

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





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17. Using elementary row transformations , find the inverse of  $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ 

**18.** Choose the correct answer in the example no . (18) so that statement becomes true .

Matrices A and B will be inverse of each other only if ......

A. AB=BA

B. AB =BA =O

C. AB =Q,BA=I

D. AB=BA=I

Answer: (D)

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**Miscellaneous Exercise 3** 

1. Let A  $A = egin{bmatrix} 0 & 1 \ 0 & 0 \end{bmatrix}$  , show that  $\left(aI + bA
ight)^n = a^nI + na^{n-1}bA$ , where I

is the identity matrix of order 2 and  $n \in N$ .

2. નીયોના આપેલા પ્રશ્નન નંબર 9 થી 14 ની માગ્યા મુજખ ગણતરી કરી જવાખ આપો ( દરેકના 3 ગુણ છે.)

જો 
$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$
 હોય ,તો સાખિત કરો કે $A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}$ ,  $n \in N =$ 

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**3.** If 
$$A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$$
, then prove that  $A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$  where n is any positive integer .

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**4.** If A and B are symmetric matrices , prove that AB - BA is a skew symmetric matrix.

5. Show that the matrix B'AB is symmetric or skew symmetric according as

A is symmetric or skew symmetric .

**6.** Find the values of x,y,z if the matrix

$$A = egin{bmatrix} 0 & 2y & z \ x & y & -z \ x & -y & z \end{bmatrix}$$
 satisfy the equation A'A=I.

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7. For what values of x:

8. If 
$$A = egin{bmatrix} 3 & 1 \ -1 & 2 \end{bmatrix}$$
, show that  $A^2 - 5A + 7I = O.$ 

**9.** Find x , if 
$$[x - 5 - 1] \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O.$$

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**10.** A manufacture produces three products x,y,z which he sells in two

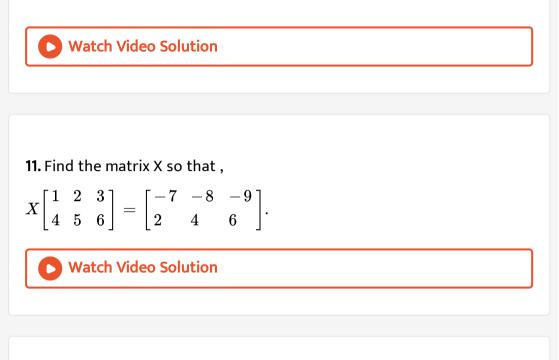
markets . Annual sales are indicated below :

Market	Products		
	x	у	z
I	10,000	2,000	18,000
II	6,000	20,000	8,000

(a) If unit sale prices of x,yand z are Rs. 2.50, Rs. 1.50 and Rs. 1.00, respectively, find the total revenue in each market with the help of matrix algebra.

(b) If the unit costs of the above three commodities are Rs. 2.00, Rs. 1.00

and 50 paise repectively .Find the gross profit.



12. If A and B are square matrices of the same order such that AB=Ba , then prove by inducation that  $AB^n=B^nA$ . Further , prove that  $(AB)^n=A^nB^n$  for all  $n\in N.$ 

13. If 
$$A = egin{bmatrix} lpha & eta \ \gamma & -lpha \end{bmatrix}$$
 is such that  $A^2 = I$ , then .....

A. 
$$1+lpha^2+eta\gamma=0$$
  
B.  $1-lpha^2+eta\gamma=0$   
C.  $1-lpha^2-eta\gamma=0$   
D.  $1+lpha^2-eta\gamma=0$ 

#### Answer: C



14. If the matrix A is both symmetric and skew symmetric ,then ......

A. is a diagonal matrix

B. is a zero matrix

C. is a square matrix

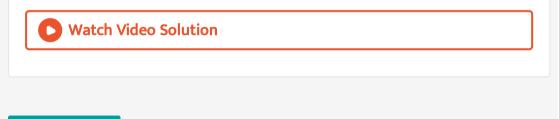
D. None of these

#### Answer: B



15. If A is square matrix such that  $A^2 = A$ , then  $(I + A)^3 - 7A$  is equal to ..... A. A B. I-A C. I D. 3A

#### Answer: C



**Practice Work** 

- 1. Construct 3 imes 3 matrix  $A=\left[a_{ij}
  ight]$  whose elements are given by
- $a_{ij}=2i-3j.$

**2.** Construct a 3 imes 4 matrix  $A=\left[a_{ij}
ight]$  whose elements are given by

$$a_{ij} = \left\{egin{array}{cc} 3i-2j, ext{where} & i 
eq j \ 0, ext{where} & i=j \end{array}
ight.$$

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3. Construct a 3 imes 2 matrix  $A=ig[a_{ij}ig]$ , whose elements are given by

$$a_{ij} = \left\{egin{array}{ccc} i-j, & i < j \ i+j, & i=j. \ i \cdot j, & i > j \end{array}
ight.$$

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4. Obtain a  $m \times n$  matrix  $A = \begin{bmatrix} a_{ij} \end{bmatrix}$  . Such that  $a_{ij} = 2i - j, m = 2, n = 4.$ 

5. What is the order of the matrix

$$A = egin{bmatrix} 1 & 1 & 9 & -11 \ 2 & 3 & 8 & -15 \ 3 & -7 & -12 & -6 \end{bmatrix}$$
? Write the elements

 $a_{12}, a_{21}, a_{24}, a_{31}, a_{34}$ , of a matrix A.

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**6.** Find the value of x and y from the equation.

$$egin{bmatrix} 3x+7 & 5 \ y+1 & 2-3x \end{bmatrix} = egin{bmatrix} -2 & 5 \ 1 & 11 \end{bmatrix}$$

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7. Find the value of x, y,z and w from the equation.

$$egin{bmatrix} x & 3x-y \ 2x+z & 3y-w \end{bmatrix} = egin{bmatrix} 3 & 2 \ 4 & 7 \end{bmatrix}$$

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**8.** Find the value of x,y and z.

$$egin{bmatrix} x+y+z \ x+y \ y+z \end{bmatrix} = egin{bmatrix} 7 \ 5 \ 3 \end{bmatrix}$$

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**9.** Find the value of a,b,cand d.

$$egin{bmatrix} a & 3a-b \ 2a+c & 3b-d \end{bmatrix} = egin{bmatrix} 3 & 2 \ 7 & 7 \end{bmatrix}$$

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**10.** Find the value of a,b,c,x,y and z.

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

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11.

$$A = egin{bmatrix} 2 & -1 \ 4 & 2 \end{bmatrix} B = egin{bmatrix} 4 & 3 \ -2 & 1 \end{bmatrix} ext{ and } C = [(-2, -3), (-1, 2):]]$$
 Find

the following (1) 2B+3C,(2)A+(B+C),(3)(2A-3B)-Cand4)(B+C)-2A.



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

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Let

**13.** If 
$$A = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$  then find AB. Also find BA if it

exists ?

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**14.** 
$$A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$  then find AB and BA. Show

that  $AB \neq BA$ .

15.

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Compute: 
$$\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix} \left( \begin{bmatrix} 1 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 1 & 3 \\ 1 & 0 & 2 \end{bmatrix} \right).$$

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16. Find X and Y,if

$$X+Y=egin{bmatrix} 5&2\0&9 \end{bmatrix} ext{ and } X-Y=egin{bmatrix} 3&6\0&-1 \end{bmatrix}.$$

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**17.** If 
$$A + B = \begin{bmatrix} 4 & 3 & 2 \\ 4 & 1 & 7 \\ 3 & 2 & 0 \end{bmatrix}$$
 and  $A - B = \begin{bmatrix} 6 & 1 & 4 \\ -4 & 3 & 9 \\ 5 & 8 & 2 \end{bmatrix}$  Then find A

and B.

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**18.** If 
$$Y = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$$
 and  $3X - Y = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}$  then find X.

**19.** If 
$$f(x) = x^2 - 2x$$
 then find f(A) where  $A = \begin{bmatrix} 0 & 1 & 2 \\ 4 & 5 & 0 \\ 0 & 2 & 3 \end{bmatrix}$ .

**20.** Solve : 
$$\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} + 2 \begin{bmatrix} 2x \\ 3y \end{bmatrix} = 3 \begin{bmatrix} 7 \\ -3 \end{bmatrix}$$
.

**21.** 
$$A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \\ 2 & 5 \end{bmatrix}$$
 and  $B = \begin{bmatrix} -1 & 2 \\ 0 & 5 \\ 3 & 1 \end{bmatrix}$  then find

the matrix X. where

A+B-X=0.0 is a zero matrix.

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22. Find 
$$A^2 - 5A + 6I$$
, if  $A = egin{bmatrix} 2 & 0 & 1 \ 2 & 1 & 3 \ 1 & -1 & 0 \end{bmatrix}$ .

**23.** If 
$$A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$$
 and  $A^2 = 8A + KI$  then find K.

**24.** Prove that , 
$$\left\{ \begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix} + \begin{bmatrix} \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \\ \omega & \omega^2 & 1 \end{bmatrix} \right\} \begin{bmatrix} 1 \\ \omega \\ \omega^2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

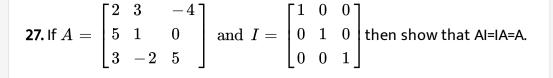
where  $\omega$  is the cube root of unit.

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25. If  $A = \begin{bmatrix} 1 & \alpha \\ 0 & 1 \end{bmatrix}$  then by the principle of mathematical induction . Prove that  $A^n = \begin{bmatrix} 1 & n\alpha \\ 0 & 1 \end{bmatrix}$ ,  $\forall n \in N$ .

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**26.** If 
$$A = \begin{bmatrix} 0 & 1 & 2 \\ 2 & -3 & 0 \\ 1 & -1 & 0 \end{bmatrix}$$
 and  $f(x) = x^3 + 4x^2 - x$ , then find f(A).



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**28.** Three friends Ram , Shyam and Rahul went to a shop .Ram purchased 12 dozen notebooks ,6 dozen pen and 10 dozen pencil . Shyam purchased 20 dozen notebooks , 10 dozen pen and 15 dozen pencils . If the price of 1 dozen notebooks , pen and pencil is respectively Rs 72, Rs. 48 and Rs. 18 . Using matrix equation find the amount paid by each person to shopkeepar .

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**29.** Two farmers Ramkishan and Gurpreet singh cultivates only three varieties of rice namely Basmati , perimal and Jirasar .The sales (in Rs.) of these varieties of rice by both the farmers in the months of September October are given by the following matrices A and B.

	Septe	mber	
	Basmati	Parimal	Jirasar
Ramkishan	10,000	20,000	30,000
Gurupreet Singh	50,000	30,000	10,000
	Octo	ber	
	Basmati	Parimal	Jirasar
Ramkishan	5,000	10,000	6,000
Gurupreet Singh	20,000	10,000	10,000

(i) Find the combined sales in September and October for each farmer in each variety.

,

(ii) In which month the selling is maximum.

**30.** 
$$A = \begin{bmatrix} 5 & -1 \\ 6 & 7 \end{bmatrix}$$
,  $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$  then verify that  
(i) (A)=A  
(ii) (A+B)=A+B  
(iii) (3A)'=3A  
(iv) (AB)'=B'A'



**31.** 
$$A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & -2 & 4 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ -1 & 3 \end{bmatrix}$  then verify that (AB) =B'A.

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**32.** If 
$$A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$$
 then show that A A'=A'A=I.

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**33.** If 
$$A = \begin{bmatrix} 1 & 2 & 5 \\ 5 & 1 & 1 \\ 3 & 0 & 4 \end{bmatrix}$$
 then find A-2A'.

34. For the matrices A and B, verify that (AB)'=B'A.

(i) 
$$A = \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix}, B = \begin{bmatrix} 2 & 4, & 5 \end{bmatrix}$$
  
(ii)  $A = \begin{bmatrix} 5 & 3 & -1 \\ 2 & 0 & 4 \end{bmatrix} B = \begin{bmatrix} -3 & 2 \\ 2 & 1 \\ -1 & 0 \end{bmatrix}$ 

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**35.** Express the matrix 
$$B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$$
 as the sum of a symmetric

and a skew symmetric matrix.

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36. Show that all the diagonals elements of a skew symmetric matrix are

zero .



37. Prove that if A is a square matrix then ,(i) (A+A') is a symmetric metrix.

(ii) (A-A') is a skew symmetric matrix.



**38.** Express the matrix  $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & -2 \\ 1 & 4 & 5 \end{bmatrix}$  as the sum of a symmetric and

a skew symmetric matrix .

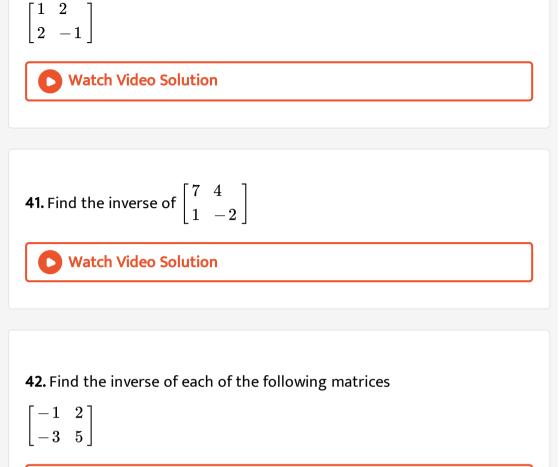
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**39.** If a matrix A is a symmetric matrix then show that  $A^n$  is also a symmetric matrix . Where  $n \in N$ .



**40.** Using elementary transformations find the inverse of each of the

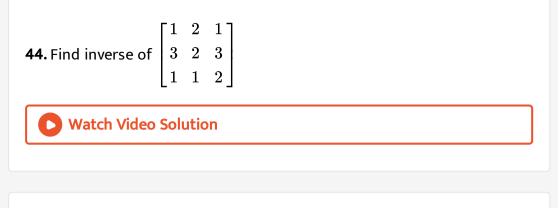
following matrices, if it exist.





# 43. Find adjoint of each of the matrices

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



**45.** If 
$$A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$$
 then prove that  $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N.$ 

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46. Find the matrix X such that ,

$$Xegin{bmatrix} 5 & -7 \ -2 & 3 \end{bmatrix} = egin{bmatrix} -16 & -6 \ 7 & 2 \end{bmatrix}$$

47. Find the matrix X such that,

$$egin{bmatrix} 2 & -1 \ 1 & 0 \ -3 & 4 \end{bmatrix} X = egin{bmatrix} -1 & -8 & -10 \ 1 & -2 & -5 \ 9 & 22 & 15 \end{bmatrix}.$$

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**48.** Find x, if 
$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$$

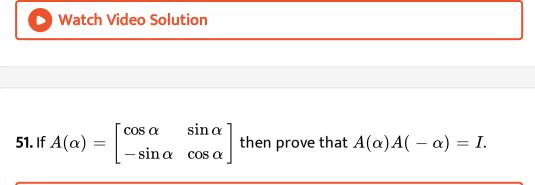
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**49.** Find the real numbers x and y so that  $\left(xI+yA
ight)^2=A$ , where

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

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**50.** For square matrices A and B , AB=A and BA =B, then prove that  $A^2 = A$  and  $B^2 = B$ .



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52. If 
$$A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$$
 is symmetric matrix then find x.

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53. 
$$A=egin{bmatrix} a&b\0&1\end{bmatrix}, a
eq1$$
 then prove that  $A^n=egin{bmatrix} a^n&rac{b(a^n-1)}{a-1}\\0&1\end{bmatrix}, n\in N.$ 

# Watch Video Solution

54.  $A = egin{bmatrix} 4 & 3 \ 2 & 5 \end{bmatrix}, A^2 - xA + yI = 0.$  Find real numbers x and y. where I

is a 2 imes 2 identity matrix.

**55.** If 
$$A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$
 and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$  then prove that  $(aI + bA)^3 = a^3I + 3a^2bA.$ 

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Textbook Based Mcqs

**1.** If 
$$\begin{bmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$$
 then AA ' is a ...... matrix.

A. Symmetric

B. Skew symmetric

C. Orthogonal

D. None of these

#### Answer: A

2. If a matrice 
$$\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$$
 is a orthogonal matrix then ......  
A.  $\alpha = \pm \frac{1}{\sqrt{2}}$   
B.  $\beta = \pm \frac{1}{\sqrt{6}}$   
C.  $\gamma = \pm \frac{1}{\sqrt{3}}$ 

D. Given all

# Answer: D

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**3.** If 
$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
 then  $A^2 + 2A$ = .....

A. 4A

B. 3A

C. 2A

D. A

#### Answer: B



**4.** If 
$$A = \begin{bmatrix} 2 & -1 \\ 2 & 1 \end{bmatrix}$$
,  $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$  and  $(A + B)^2 = A^2 + B^2 + 2AB$ 

then .....

A. 
$$a = 2, b = -2$$

 $\mathsf{B.}\,a=2,b=2$ 

C. 
$$a = -2, b = 2$$

D. 
$$a = -2, b = -2$$

### Answer: D

5. If  $A=egin{bmatrix}i&0\0&i\end{bmatrix},n\in N$  then  $A^{4n}=$  ..... (where I is imaginary complex number and  $i^2=-1$ )

A. 
$$\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$$
  
B. 
$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$
  
C. 
$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
  
D. 
$$\begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$$

### Answer: C

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**6.** 
$$U = \begin{bmatrix} 2 & -3 & 4 \end{bmatrix}, V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix} X = \begin{bmatrix} 0 & 2 & 3 \end{bmatrix}$$
 and  $Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$  then

UV +XY=.....

A. 20

B. [-20]

C.-20

D. [20]

Answer: D

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7. If A is a square matrix then A - A' is a ..... matrix.

A. Skew symmetric

B. Symmetric

C. Diagonal

D. Orthogonal

Answer: A

8. For matrices A and B, A +B and AB are difined then .....

A. A and B are any matrices

B. A and B are square matrices but not necessary having equal order

C. A and B are square matrices of some order

D. No. of coloumn in A=No. of row in B.

#### Answer: C

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**9.** If  $A = [a \ b], B = [-b \ -a]$  and  $C = \begin{bmatrix} a \\ -a \end{bmatrix}$  then out of the

following ...... statement is true.

A. A=-B

B. A+B=A-B

C. AC =BC

D. CA =CB

# Answer: C

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**10.** If 
$$A(x) = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$$
 then  $A\left(\frac{\pi}{2}\right)$ .  $A(\pi)$ = .....

B. 
$$A\Big(-rac{\pi}{2}\Big)$$
  
C.  $A\Big(-rac{3\pi}{2}\Big)$   
D.  $A(-\pi)$ 

### Answer: C

11. If 
$$A = egin{bmatrix} 1 & 1 \ 1 & 1 \end{bmatrix}$$
 then  $A^{100}$  .....

A. 100 A

 $\mathrm{B.}\,2^{99}A$ 

 $\mathsf{C}.\,2^{100}A$ 

D. 99 A

#### Answer: B

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**12.** Matrix 
$$\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$$
 is a ..... matrix.

A. Skew symmetric

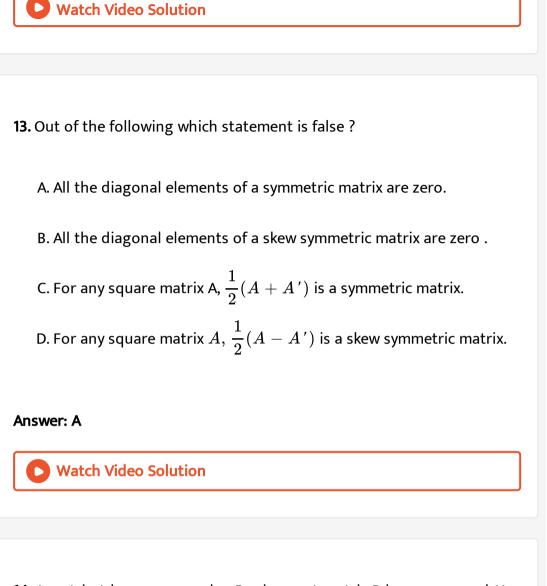
B. Symmetric

C. Diagonal

D. Zero

### Answer: A





**14.** A matrix A has x rows and x+5 column . A matrix B has y rows and 11 -y column . A matrix B has y rows and 11 - y column . If AB and BA are exist then the value of x and y are respectively ......

B. 8,3

C. 3,8

D. 4,8

### Answer: C



**15.** 
$$P = \begin{bmatrix} \frac{2}{3} & 3k & a \\ -\frac{1}{3} & -4k & b \\ \frac{2}{3} & -5k & c \end{bmatrix}$$
 If  $PP^T = I$  and  $k = \frac{1}{\sqrt{50}}$  then the value of

a,b,c are respectively .....

$$\begin{aligned} \mathsf{A}. \pm \frac{16}{5\sqrt{2}}, \ \pm \frac{13}{5\sqrt{2}}, \ \pm \frac{1}{3\sqrt{2}} \\ \mathsf{B}. \pm \frac{1}{3\sqrt{2}}, \ \pm \frac{13}{5\sqrt{2}}, \ \pm \frac{16}{15\sqrt{2}} \\ \mathsf{C}. \pm \frac{13}{15\sqrt{2}}, \ \pm \frac{16}{15\sqrt{2}}, \ \pm \frac{16}{3\sqrt{2}} \end{aligned}$$

D. None of these

# Answer: C

16. C is a skew symmetric matrix of order n. X is a column matrix of order

n imes 1, then X'CX is a ..... matrix.

A. Square

B. Identity

C. Zero

D. None of these

#### Answer: C

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17. If  $A^2 = A$  then  $(I + A)^4 =$  .....

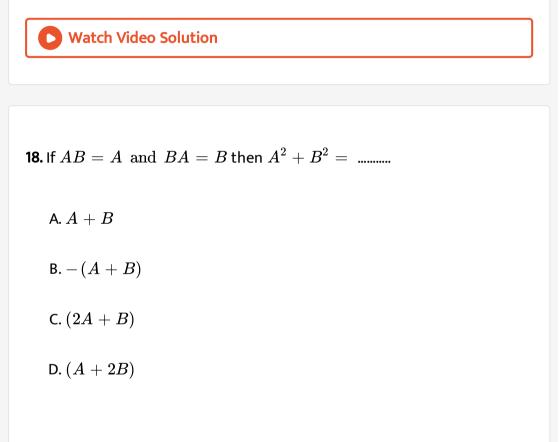
A. I + A

 $\mathsf{B}.\,I+4A$ 

 $\mathsf{C}.\,I+15A$ 

D. None of these

Answer: C



Answer: A

**19.** If A is any square matrix then AA' is a ....... Matrix.

A. Symmetric

B. Skew symmetric

C. Identity

D. Diagonal

#### Answer: A

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**20.** If A and B are square matrices of same order then  $\left(A^{-1}BA
ight)^n$ = ......,

 $n\in N.$ 

A.  $A^{-n}B^nA^n$ 

B.  $A^n B^n A^{-n}$ 

 $\mathsf{C}.\,A^{\,-\,1}B^nA$ 

D. 
$$n(A^{-1}BA)$$



21. 
$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & a & 1 \end{bmatrix} \text{ and } A^{-1} = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & c \\ \frac{5}{2} & -\frac{3}{2} & \frac{1}{2} \end{bmatrix} \text{ then}$$
$$a = \dots \text{ and } c = \dots \dots$$
A 1,1  
B. 1,-1  
C. 1,2  
D. -1, 1

#### Answer: B

22. 
$$\begin{bmatrix} \frac{1}{25} & 0\\ x & \frac{1}{25} \end{bmatrix} = \begin{bmatrix} 5 & 0\\ -a & 5 \end{bmatrix}^{-2}$$
 then x =.....

B. 
$$\frac{2a}{25}$$
  
C.  $\frac{2a}{125}$   
D.  $\frac{2a}{25}$ 

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**23.** 
$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = 0$$
 then x=.....

B. -1

$$\mathsf{C}.\,\frac{-9\pm\sqrt{53}}{2}$$

D. None of these



**24.** A is a  $3\times 4$  matrix .A matrix B is such that A'B and BA' are defined . Then the order of B is ......

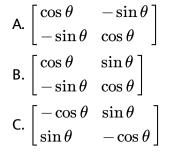
A.  $3 \times 4$ B.  $3 \times 3$ C.  $4 \times 4$ 

D. 4 imes 3

Answer: A



**25.** P is a 2 imes 2 matrix .  $P' = P^{-1}$  then P=.....



D. None of these

#### Answer: B

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# **26.** A is a 3 imes 3 matrix , then |3A| = .... |A|.

A. 3

B. 6

C. 9

D. 27

#### Answer: D

27. If  $A=ig[a_{ij}ig]_{n imes n}$  such that  $a_{ij}=0$ , for i
eq j then , A is ……… $ig(a_{ij}
eq a_{jj}ig)(n>1)$ 

A. a column matrix

B. a row matrix

C. a diagonal matrix

D. a scalar matrix.

# Answer: C

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**28.** 
$$A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$$
, the correct statement is .....

A.  $A^{-1}$  does not exist

B.  $A = (-1)I_3$ 

 $\mathsf{C}.\,A^2=I$ 

D. A is a diagonal matrix.

Answer: C



### Answer: B

30.	The	system	of	equations		
$ax + y + z = a - 1, x + ay + z = a - 1   ext{ and }  x + y + az = a - 1$						
does not have unique solution if a =						
A. 1 or -2						
B. 3						
C. 2						

# Answer: A

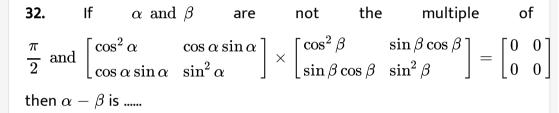
D. - 1

**31.** If 
$$A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$$
 and  $A^2 = \begin{bmatrix} x & y \\ y & x \end{bmatrix}$  then , x=...., y=.....  
A.  $x = a^2 + b^2$ ,  $y = a^2 - b^2$   
B.  $x = 2ab$ ,  $y = a^2 + b^2$   
C.  $x = a^2 + b^2$ ,  $y = ab$ 

D. 
$$x=a^2+b^2, y=2ab$$

#### Answer: D





A. any multiple of  $\pi$ 

B. odd multiple of  $\frac{\pi}{2}$ 

C. 0

D. odd multiple of  $\pi$ 

#### Answer: B

**33.** If 
$$\begin{bmatrix} x & 0 \\ 1 & y \end{bmatrix} - \begin{bmatrix} 2 & -4 \\ -3 & -4 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 6 & 3 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$$
 then , x=..., y=....

A. 
$$x = 3, y = 2$$

B. 
$$x = 3, y = -2$$

C. 
$$x = -3, y = -2$$

D. 
$$x = -3, y = 2$$

### Answer: B

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**34.** If inverse of 
$$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$$
 is  $\frac{1}{10} \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$  then  $\alpha$  =....

A. 5

B. - 5

C. 2

 $\mathsf{D}.-2$ 

# Answer: A



**35.** If 
$$AB = BA$$
 and  $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$  then, B=.....

A. 
$$\begin{bmatrix} x & x \\ y & 0 \end{bmatrix}$$
  
B. 
$$\begin{bmatrix} x & y \\ 0 & x \end{bmatrix}$$
  
C. 
$$\begin{bmatrix} x & y \\ 0 & y \end{bmatrix}$$
  
D. 
$$\begin{bmatrix} x & x \\ 1 & x \end{bmatrix}$$

### Answer: B

**36.** If 
$$A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$$
 and  $A^2 = kA = 5I = O$ ,then k =....

	7
•	
	٠

C. 5

D. 9

## Answer: C

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**37.** If 
$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = 0$$
, then x=....  
A.  $\frac{-9 \pm \sqrt{35}}{2}$   
B.  $\frac{-7 \pm \sqrt{53}}{2}$   
C.  $\frac{-9 \pm \sqrt{53}}{2}$   
D.  $\frac{-7 \pm \sqrt{35}}{2}$ 

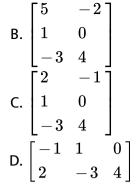
### Answer: C

**38.** Matrix 
$$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$$
 if  $AA^T = I$  then  
 $(x, y, z) = (..., ..., ...)(x, y, z > 0)$   
A.  $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{6}}\right)$   
B.  $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{6}}, \frac{1}{\sqrt{3}}\right)$   
C.  $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{6}}\right)$   
D.  $\left(\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}\right)$ 

,

### Answer: B

**39.** If 
$$A\begin{bmatrix} 1 & -2 & -5 \\ 3 & 4 & 0 \end{bmatrix} = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$$
 then ,A=.....



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$$\begin{aligned} \mathbf{40.} & \text{If } A = \begin{bmatrix} \cos \frac{2\pi}{3} & -\sin \frac{2\pi}{3} \\ \sin \frac{2\pi}{3} & \cos \frac{2\pi}{3} \end{bmatrix} \text{then , } A^3 = \dots \\ & \text{A.} \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \\ & \text{B.} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \\ & \text{C.} \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix} \\ & \text{D.} \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \end{aligned}$$

#### Answer: B

41. Check , whether , 
$$\frac{1}{11}\begin{bmatrix} -1 & 8 & \alpha \\ 1 & -19 & 14 \\ 2 & 6 & -5 \end{bmatrix}$$
 is an inverse of  
 $A = \begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ , if so , that  $\alpha$ =.....  
A - 3  
B. 2  
C. `-5  
D. does not exist  
Answer: A  
Number of the second state of th

**42.** If 
$$A = egin{bmatrix} 2x & 9 \ -3 & -2 \end{bmatrix}$$
 and  $|A| = 3$  then x = ....,  $x \in R$ 

A. 7.5

B. 6

C. 15

D. 12

### Answer: B

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**43.** For 
$$A=ig[a_{ij}ig]_{n imes n}$$
' $a_{ij}=0, i
eq j$  then is a .... matrix  $ig(a_{ii}
eq a_{ij}ig), (n>1)$ 

A. Raw matrix

B. column matrix

C. Diagonal matrix

D. Scalar matrix

### Answer: C

**1.** Consider the following information regarding the number of men and

women workers in three factories I,II and III :

Men workers		Women workers	
Ι	30		25
II	25		31
III	27		26

Represent the above information in the form of a3 imes 2 matrix . What

does the entry in the third row and second column represent ?

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2. If a matrix has 8 elements , what are the possible orders it can have ?

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**3.** Construct a 3 imes 2 matrix whose elements are given by  $a_{ij}=rac{1}{2}|i-3j|.$ 



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

Find the values of a,b,c,x,y and z.

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5. Find the values of a,b,c,and d from the following equation :

 $egin{bmatrix} 2a+b&a-2b\ 5c-d&4c+3d \end{bmatrix} = egin{bmatrix} 4&-3\ 11&24 \end{bmatrix}$ 

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**6.** Given 
$$A = \begin{bmatrix} \sqrt{3} & 1 & -1 \\ 2 & 3 & 0 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & \sqrt{5} & 1 \\ -2 & 3 & \frac{1}{2} \end{bmatrix}$  find A+B.

**7.** If 
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ , then find  $2A - B$ .

8. If 
$$A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$ , then find the matrix X,

such that 2A+3X=5B.

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$$X+Y=egin{bmatrix} 5&2\0&9 \end{bmatrix} ext{ and } X-Y=egin{bmatrix} 3&6\0&-1 \end{bmatrix}.$$

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**10.** Find the values of x and y from the following equation ,  $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}.$  **11.** Two farmers Ramkishan and Gurpreet singh cultivates only three varieties of rice namely Basmati , perimal and Jirasar .The sales (in Rs.) of these varieties of rice by both the farmers in the months of September October are given by the following matrices A and B.

1	Septe	mber	
	Basmati	Parimal	Jirasar
Ramkishan	10,000	20,000	30,000
Gurupreet Singh	50,000	30,000	10,000
	Octo	ber	
	Basmati	Parimal	Jirasar
Ramkishan	5,000	10,000	6,000
Gurupreet Singh	20,000	10,000	10,000

(i) Find the combined sales in September and October for each farmer in

each variety.

(ii) In which month the selling is maximum.



**12.** Find AB, if 
$$A = \begin{bmatrix} 6 & 9 \\ 2 & 3 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 6 & 0 \\ 7 & 9 & 8 \end{bmatrix}$ .

**13.** If 
$$A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ , then find AB ,BA .Show

that  $AB \neq BA$ .

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**14.** If 
$$A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ , then  $AB = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$   
and  $BA = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ . Clearly  $AB \neq BA$ .

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**15.** Find AB, if 
$$A = \begin{bmatrix} 0 & -1 \\ 0 & 2 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 3 & 5 \\ 0 & 0 \end{bmatrix}$ .

16.

$$A = egin{bmatrix} 1 & 1 & -1 \ 2 & 0 & 3 \ 3 & -1 & 2 \end{bmatrix}, B = egin{bmatrix} 1 & 3 \ 0 & 2 \ -1 & 4 \end{bmatrix} ext{ and } C = egin{bmatrix} 1 & 2 & 3 & -4 \ 2 & 0 & -2 & 1 \end{bmatrix},$$

find A(BC), (AB)C and show that (AB) C=A(BC),

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**17.** If 
$$A = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix}$$
,  $B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ ,  $C = \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix}$ .

Calculate AC, BC and (A+B)C. Also , verify that (A+B)C=AC+BC.

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18. If 
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$$
, then show that  $A^3 - 23A - 40I = O.$ 

If

**19.** In a legislative assembly election , a political group hired a public relations form to promote its candidate in three ways , telephone , house calls , and letters . The cost per contect (in paise ) Cost per contact

$$A = \begin{bmatrix} 40\\100\\50 \end{bmatrix}$$
Telephone  
Housecall  
Letter

The number of contacts of each type made in two cities X and Y is given

	Telephone	Housecall	Letter ]	V
B=	1000	500	5000	ightarrow X ightarrow Y
	3000	1000	10,000	$\rightarrow 1$

Find the total amount spent by the group in the two cities X and Y.

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**20.** If 
$$A = \begin{bmatrix} 3 & \sqrt{3} & 2 \\ 4 & 2 & 0 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$  verify that (i) (A')'=A (ii) (A+B)' =A'+B'

(iii) (kB)'=kB ', where k is any constant.

21. If 
$$A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$$
,  $B = \begin{bmatrix} 1 & 3-6 \end{bmatrix}$ , verify that (AB)'=B'A'.

**22.** Express the matrix 
$$B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$$
 as the sum of a symmetric

and a skew symmetric matrix.

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23. By using elementary operations , find the inverse of the matrix

$$A = egin{bmatrix} 1 & 2 \ 2 & -1 \end{bmatrix}$$

24. Obtain the inverse of the following matrix using elementary

operations 
$$A = egin{bmatrix} 0 & 1 & 2 \ 1 & 2 & 3 \ 3 & 1 & 1 \end{bmatrix}$$

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**25.** Find 
$$P^{\,-1}$$
 , if it exists given  $P=egin{bmatrix} 10 & -2 \ -5 & 1 \end{bmatrix}$  .

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26. If 
$$A = egin{bmatrix} \cos heta & \sin heta \ -\sin heta & \cos heta \end{bmatrix}$$
 then prove that  $A^n = egin{bmatrix} \cos n heta & \sin n heta \ -\sin n heta & \cos n heta \end{bmatrix}, n \in N.$ 

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27. If A and B are symmetric matrices of the same order , then show that

AB is symmetric if and only if A and B commute , that is AB=BA.

**28.** Let 
$$A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}, C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}.$$

Find a matrix D such that CD-AB=O

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Solutions Of Ncert Exemplar Problems Short Answer Type Questions

1. If a matrix has 28 elements , what are the possible orders it can have ?

What if it has 13 elements ?

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2. In the matrix 
$$A=egin{bmatrix}a&1&x\\2&\sqrt{3}&x^2-y\\0&5&-rac{2}{5}\end{bmatrix}$$
 , write :

(i) The order of the matrix A

- (ii) The number of elements
- (iii) Write elements  $a_{23}, a_{31}, a_{12}$



**3.** Construct  $a_{2 \times 2}$  matrix where

(i) 
$$a_{ij}=rac{\left(i-2j
ight)^2}{2}$$

(ii)  $a_{ij}=ert-2i+3jert$ 

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**4.** Construct a3 imes 2 matrix whose elements are given by  $a_{ij}=e^{ix}.\sin(jx).$ 

5. Find values of a and b if A =B where  

$$A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}, B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$$
Hints for solution : In

given two square matrix if corresponding elements of each raw and column are equal then both matrix are said to be equal matrix.



6. If possible , find the sum of the matrices A and B , where 
$$A = \begin{bmatrix} \sqrt{3} & 1 \\ 2 & 3 \end{bmatrix}$$
 and  $B = \begin{bmatrix} x & y & z \\ a & b & c \end{bmatrix}$ .

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**7.** If 
$$X = \begin{bmatrix} 3 & 1 & -1 \\ 5 & -2 & -3 \end{bmatrix}$$
 and  $Y = \begin{bmatrix} 2 & 1 & -1 \\ 7 & 2 & 4 \end{bmatrix}$ , find

(i) X+Y

(ii) 2X-3Y

(iii) A matrix Z such that X+Y +Z is a zero matrix.

8. Find non - zero values of x satisfying the matrix equation :

$$x \cdot egin{bmatrix} 2x & 2 \ 3 & x \end{bmatrix} + 2egin{bmatrix} 8 & 5x \ 4 & 4x \end{bmatrix} = 2egin{bmatrix} x^2+8 & 24 \ 10 & 6x \end{bmatrix}$$
 where  $x 
eq 0$ .

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**9.** If 
$$A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$  show that

$$(A+B)\cdot (A-B)
eq A^2-B^2.$$

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**10.** Find x, if 
$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$$

**11.** Show that 
$$A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$$
 satisfies the equation  $A^2 = 3A - 7I = 0$  and hence find  $A^{-1}$ .

12. Find the matrix A satisfying the matrix equation :

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

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**13.** Find A , if 
$$\begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} A = \begin{bmatrix} -4 & 8 & 4 \\ -1 & 2 & 1 \\ -3 & 6 & 3 \end{bmatrix}$$

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**14.** If 
$$A = \begin{bmatrix} 3 & -4 \\ 1 & 1 \\ 2 & 0 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ , then verify  $(B \cdot A)^2 \neq B^2 \cdot A^2$ .

15. If possible , find BA and AB , where

$$A = egin{bmatrix} 2 & 1 & 2 \ 1 & 2 & 4 \end{bmatrix}, B = egin{bmatrix} 4 & 1 \ 2 & 3 \ 1 & 2 \end{bmatrix}$$

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16. Show by an example that for  $A \neq O, B \neq O, AB = O$ .

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**17.** Given 
$$A = \begin{bmatrix} 2 & 4 & 0 \\ 3 & 9 & 6 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 1 & 4 \\ 2 & 8 \\ 1 & 3 \end{bmatrix}$ . Is (AB)'=B'A?

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**18.** Solve for x and y :

$$x igg[ rac{2}{1} igg] + y igg[ rac{3}{5} igg] + igg[ rac{-8}{-11} igg] = igg[ rac{0}{0} igg]$$

Match Video Colution

19. If X and Y are  $2 \times 2$  matrices , then solve the following matrix

equations for X and Y

$$2X+3Y=egin{bmatrix}2&3\4&0\end{bmatrix}, 3X+2Y=egin{bmatrix}-2&2\1&-5\end{bmatrix}$$

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**20.** If  $A = [3 \quad 5], B = [7 \quad 3]$  , then find a non - zero matrix C such that

AC=BC.

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**21.** Give an example of matrices A,B and C such that AB=AC, where A is nonzero matrix, but  $B \neq C$ .

**22.** If 
$$A = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$$
,  $B = \begin{bmatrix} 2 & 3 \\ 3 & -4 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 0 \\ -1 & 0 \end{bmatrix}$  verify  
(i)  $(A \cdot B) \cdot C = A \cdot (BC)$   
(ii)  $A \cdot (B + C) = AB + AC$ 

23. If 
$$P = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$$
 and  $Q = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ , prove that  $PQ = \begin{bmatrix} xa & 0 & 0 \\ 0 & yb & 0 \\ 0 & 0 & zc \end{bmatrix} = QP.$ 

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**24.** If 
$$\begin{bmatrix} 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$$
 find A.

**25.** If 
$$A = \begin{bmatrix} 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 5 & 3 & 4 \\ 8 & 7 & 6 \end{bmatrix}$$
 and  $C = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ , verify  $A \cdot (B + C) = AB + AC$ .

**26.** If 
$$A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$$
, then verify that

 $A^2 + A = A(A + I) where I is$ 3xx3` unit matrix.

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**27.** If 
$$A = \begin{bmatrix} 0 & -1 & 2 \\ 4 & 3 & -4 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 4 & 0 \\ 1 & 3 \\ 2 & 6 \end{bmatrix}$  then verify that :  
(i)  $(A') = A$   
(ii)  $(A \cdot B)' = B' \cdot A'$   
(iii)  $(kA)' = (k \cdot A')$ 

**28.** If 
$$A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \\ 5 & 6 \end{bmatrix}$$
,  $B = \begin{bmatrix} 1 & 2 \\ 6 & 4 \\ 7 & 3 \end{bmatrix}$ , then verify that :  
(i)  $(2A + B) = 2A' + B'$ 

(ii) 
$$(A - B)' = A' - B'$$

29. Show that A'A and A A ' are both symmetric matrices for any matrix A .

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**30.** Let A and B be square matrices of the order 3 imes 3 . Is  $\left(AB
ight)^2=A^2B^2$ 

? Given reasons .



**31.** Show that if A and B are square matrics such that AB=BA , then  $\left(A+B\right)^2=A^2+2AB+B^2.$ 

32.

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}, B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}, C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix} \text{ and } a = 4, b = -2$$

shows that :

(i) A + (B + C) = (A + B) + C(ii)  $A \cdot (BC) = (AB) \cdot C$ (iii)  $(a + b)B = a \cdot B + b \cdot B$ (iv) a(C - A) = aC - aA(v)  $(A^T)^T = A$ (vi)  $(b \cdot A)^T = B^T = b \cdot A^T$ (vii)  $(A \cdot B)^T = B^T \cdot A^T$ (viii)  $(A - B) \cdot C = AC - BC$ (ix)  $(A - B)^T = A^T - B^T$ 

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Let

**33.** If 
$$A = \begin{bmatrix} \cos q & \sin q \\ -\sin q & \cos q \end{bmatrix}$$
, then show that  $A^2 = \begin{bmatrix} \cos(2q) & \sin(2q) \\ -\sin(2q) & \cos(2q) \end{bmatrix}$ .

**34.** If 
$$A = \begin{bmatrix} 0 & -x \\ x & 0 \end{bmatrix}$$
,  $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$  and  $x^2 = -1$  then show that  $(A+B)^2 = A^2 + B^2$ .

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**35.** Verify that 
$$A^2 = I$$
 when  $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ .

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**36.** Prove by Mathematical Induction that  $(A)^n = (A^n)$  where  $n \in N$  for

any square matrix A.

37. Find inverse , by elementary row operations (if possible), of the

following matrices

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

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**38.** If 
$$\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$$
 , then find values of x,y,z and w.

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**39.** If 
$$A = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$$
,  $B = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$  find a matrix C such that 3A+5B+2C is

a null matrix.

**40.** If 
$$A = egin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$$
, then find  $A^2 - 5A - 14I$ . Hence , obtain  $A^3$ .

41. Find the values of a,b ,c and d, if

$$3igg[ egin{array}{c} a & b \ c & d \end{array} = igg[ egin{array}{c} a & 6 \ -1 & 2d \end{array} + igg[ egin{array}{c} 4 & a+b \ c+d & 3 \end{array} \end{bmatrix}$$

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42. Find the matrix X such that ,

$$egin{bmatrix} 2 & -1 \ 1 & 0 \ -3 & 4 \end{bmatrix} X = egin{bmatrix} -1 & -8 & -10 \ 1 & -2 & -5 \ 9 & 22 & 15 \end{bmatrix}.$$

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**43.** If 
$$A = egin{bmatrix} 1 & 2 \ 4 & 1 \end{bmatrix}$$
, find  $A^2 + 2A + 7I$ 

44. If 
$$A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$$
, and  $A^{-1} = A'$ , find value of  $\alpha$ .  
  
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45. If the maxtrix  $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$  is a skew symmetric matrix , find the values of a,b,andc.  
  
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46. If  $p(x) = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$  then show that  $p(x) \cdot p(y) = p(x + y)$ .  
  
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47. If A is square matrix such that  $A^2 = A$ , show that  $(I + A)^3 = 7A + I$ .

**48.** If A,B are square matrices of same order and B is a skew -symmetric matrix , show that A'BA is skew symmetric.

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Solutions Of Ncert Exemplar Problems Long Answer Type Questions

**1.** If A and B are square matrices of the same order such that AB=Ba , then prove by inducation that  $AB^n = B^nA$ . Further , prove that  $(AB)^n = A^nB^n$  for all  $n \in N$ .

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2. Find the values of x,y,z if the matrix

$$A = egin{bmatrix} 0 & 2y & z \ x & y & -z \ x & -y & z \end{bmatrix}$$
 satisfy the equation A'A=I.

3. If possible , using elementary row transformations , find the inverse of

the following matrices :

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

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**4.** Express the matrix 
$$\begin{bmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 4 & 1 & 2 \end{bmatrix}$$

as the sum of a symmetric and a

skew symmetric matrix.

Solutions Of Ncert Exemplar Problems Objective Type Questions

**1.** The matrix 
$$P = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$$
 is a .....

A. square matrix

B. diagonal matrix

C. unit matrix

D. None

### Answer: A

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**2.** Total number of possible matrices of order 3 imes3 with each entry 2 or 0

is .....

A. 9

B. 27

C. 81

D. 512

Answer: D



3. If 
$$\begin{bmatrix} 2x + y & 4x \\ 5x - 7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y + 13 \\ y & x + 6 \end{bmatrix}$$
, then the value of x+y=.....  
A. 4  
B. 5  
C. 6  
D. 7

Answer: B

4.

$$A = \frac{1}{\pi} \begin{bmatrix} \sin^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x) \end{bmatrix}, B = \frac{1}{\pi} \begin{bmatrix} -\cos^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x) \end{bmatrix}$$

, then A-B is equal to .....

A. I B. O C. 2I D.  $\frac{1}{2} \cdot I$ 

### Answer: D

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5. If A and B are two matrices of the order 3 imes m and 3 imes n , respectively , and m=n , then the order of matrix (5A-2B) is ......

A. m imes 3

 $\text{B.}\,3\times3$ 

 $\mathsf{C}.\,m imes n$ 

D. 3 imes n

Answer: D

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6. If 
$$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$
, then  $A^2$  is equal to .....  
A.  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$   
B.  $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$   
C.  $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$   
D.  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 

### Answer: D

7. If matrix  $A=ig[a_{ij}ig]_{2 imes 2}$  , where  $a_{ij}=1i
eq j$  then  $A^2$  is equal to ......

A. I

**B.** A

C. 0

D. None of these

### Answer: A

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**8.** The matrix 
$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$
 is a .....

A. identity matrix

B. symmetric matrix

C. skew symmetric matrix

D. None of these

### Answer: B



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

A. diagonal matrix

B. symmetric matrix

C. skew symmetric matrix

D. Scalar matrix

### Answer: C



10. If A is matrix of order m imes n and B is a matrix such that  $AB^T$  and

 $B^T A$  both are defined , then order of matrix B is .....

A. m imes m

 $\mathsf{B.}\,n\times n$ 

 $\mathsf{C}.\,n\times m$ 

 $\mathsf{D}.\,m\times n$ 

Answer: D

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

A. skew symmetric matrix

B. null matrix

C. symmetric matrix

D. unit matrix

### Answer: A



12. If A is a square matrix such that  $A^2 = I$  then  $\left(A - I\right)^3 + \left(A + I\right)^3 - 7A$  is equal to ......

A. A

 $\mathsf{B}.\,I-A$ 

 $\mathsf{C}.\,I+A$ 

D. 3A

Answer: A

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13. For any two matrices A and B , we have ......

A. AB=BA

 $\mathsf{B.}\,AB\neq BA$ 

 $\mathsf{C.}\,AB=0$ 

### D. None of these

#### Answer: D

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**14.** On using elementary column operations  $C_2 \rightarrow C_2 - 2C_1$  in the following matrix equation  $\begin{bmatrix} 1 & -3 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$  we have :

$$A. \begin{bmatrix} 1 & -5 \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -2 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$$
$$B. \begin{bmatrix} 1 & -5 \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$$
$$C. \begin{bmatrix} 1 & -5 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 \\ -2 & 4 \end{bmatrix}$$
$$D. \begin{bmatrix} 1 & -5 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$$

#### Answer: D

15. On using elementary row operation  $R_1 o R_1 - 3R_2$  in the following

matrix equation :

$$\begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$$
  
A. 
$$\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & -7 \\ 0 & 3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$$
  
B. 
$$\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} \cdot \begin{bmatrix} -1 & -3 \\ 1 & 1 \end{bmatrix}$$
  
C. 
$$\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 1 & -7 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$$
  
D. 
$$\begin{bmatrix} 4 & 2 \\ -5 & -7 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -3 & -3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$$

### Answer: A

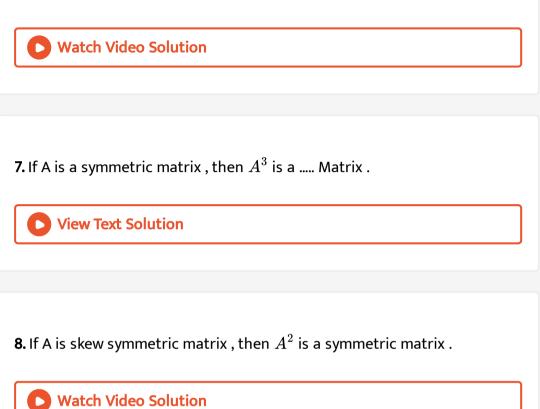
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Solutions Of Ncert Exemplar Problems Fillers

1. If the matrix A is both symmetric and skew symmetric ,then ......

<b>2.</b> Sum of two skew symmetric matrices is always matrix.
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<b>3.</b> The negative of a matrix is obtained by multiplying it by
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<b>4.</b> The product of any matrix by the scalar Is the null matrix .
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<b>5.</b> A matrix which is not a square matrix is called a Matrix.
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## 6. Matrix multiplication is ..... Over addition .

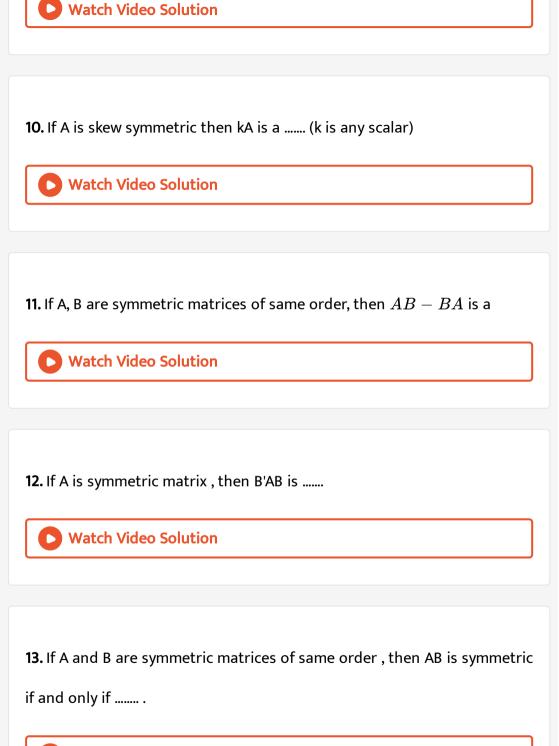


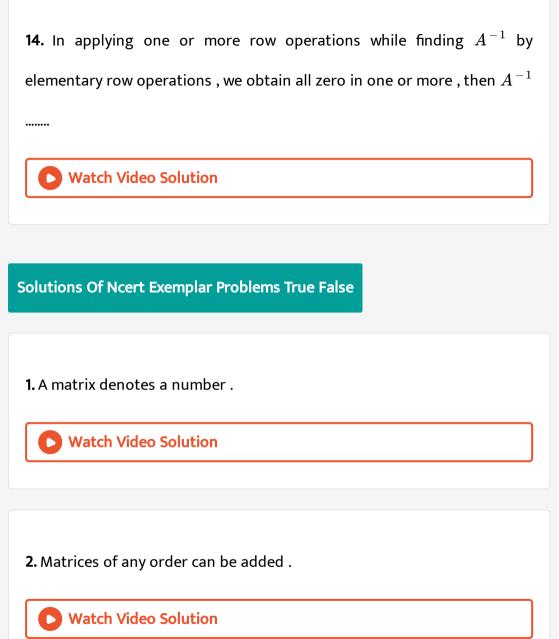
9. If A and B are square matrices of the same order , then

- (i) (*AB*) = .....
- (ii) (kA) ' = .....
- (iii) [k(A-B)] ' =.....

k is any scalar)

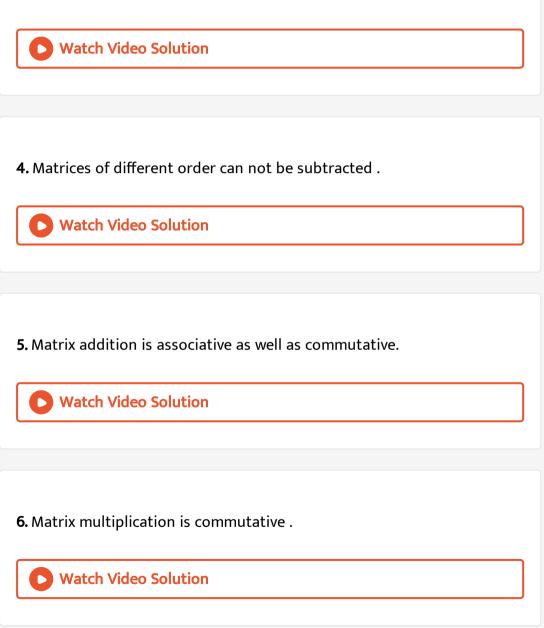






3. Two matrices are equal if they have same number of rows and same

number of columns .



7. A square matrix where every element is unity is called an identity

matrix.



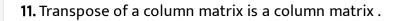
8. If A and B are two square matirces of the same order , then A + B = B + A.

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9. If A and B are two matrices of the same order , then A-B=B-A.



10. If matrix AB=O , then A=O or B=O or both A and B are null matrices .



**12.** If A and B are two square matrices of the same order , then AB=Ba.

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**13.** If each of the three matrices of the same order are symmetric , then

their sum is a symmetric matrix.

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**14.** If A and B are two matrices of the same order , then (AB) =A'B.

**15.** If (AB)=B'A', where A and B are not square matrices , then number of rows in A is equal to number of columns in B and number of columns in A is equal to number of rows in B.

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16. If A, B and C are square matrices of same order, then AB=AC always

implies that B=C.

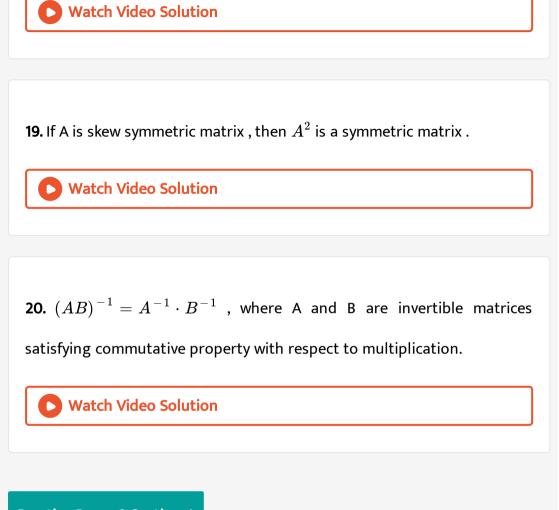
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17. A A' is always a symmetric matrix for any matrix A.

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**18.** If 
$$A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 4 & 2 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ , then AB and BA are defined

and equal.



Practice Paper 3 Section A

1. A is a 3 imes 3 matrix , then |3A|=....|A|.

A. 3

B. 6

C. 9

D. 27

#### Answer:

•••••



2. The solution of the matrix equation of 
$$\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 4 \begin{bmatrix} 2x \\ y \end{bmatrix} = \begin{bmatrix} -7 \\ 12 \end{bmatrix} =$$

A. 
$$x = 1, y = 7$$

B. 
$$x = -2, y = 6$$

C. 
$$x = 1, y = -2$$

D. None of these

### Answer:

**3.** If 
$$A = \begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$   
A.  $\begin{bmatrix} 11 & 8 \\ 11 & 28 \end{bmatrix}$   
B.  $\begin{bmatrix} 11 & 8 \\ 28 & 11 \end{bmatrix}$   
C.  $\begin{bmatrix} 8 & 11 \\ 11 & 28 \end{bmatrix}$   
D.  $\begin{bmatrix} 11 & -8 \\ -11 & 28 \end{bmatrix}$ 

#### Answer:

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**4.** If  $A=ig[a_{ij}ig]_{n imes n}$  such that  $a_{ij}=0$ , for i
eq j then , A is ………  $ig(a_{ij}
eq a_{jj}ig)(n>1)$ 

A. column matrix

B. row matrix

C. Diagonal matrix

D. Scalar matrix

#### Answer:



Practice Paper 3 Section B

**1.** Find the values of x,y,z and r from the equation  

$$2\begin{bmatrix} x & z \\ y & r \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$$

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**2.** If 
$$A = \begin{bmatrix} 1,7 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ , then find AB.

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**3.** If 
$$A(\alpha) = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$$
 then prove that  $A(\alpha)A(-\alpha) = I$ .

**4.** If the matrices  $A = \begin{bmatrix} 3 & 0 \\ 4 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & 0 \\ -4 & 3 \end{bmatrix}$ , then without multiplication of matrices find  $A^2 + AB + 6B$ .

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Practice Paper 3 Section C

**1.** Find x, if 
$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$$

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2. Express the matrix  $A = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$  as the sum of a symmetric

and a skew symmetric matrix .

**3.** Prove that 
$$:A^2-6A+17I_2=0.$$
 When  $A=\left[egin{array}{cc}2&-3\\3&4\end{array}
ight]$  Also find  $A^{-1}.$ 

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**4.** Find the values of x,y,z if the matrix

$$A = egin{bmatrix} 0 & 2y & z \ x & y & -z \ x & -y & z \end{bmatrix}$$
 satisfy the equation A'A=I.

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5. નીયોના આપેલા પ્રશ્ન્ન નંબર 9 થી 14 ની માગ્યા મુજખ ગણતરી કરી જવાખ આપો (

દરેકના ૩ ગુણ છે.)

**1.** If 
$$A = \begin{bmatrix} 0 & \tan \frac{\alpha}{2} \\ \tan \frac{\alpha}{2} & 0 \end{bmatrix}$$
 and I theidentity matrix of order 2, show that  $I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$ .

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Practice Paper 3 Section D

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