CLASS XII **MATHEMATICS**

ALGEBRA (10 MARKS)

MATRICES

MATRIX: A matrix is an ordered rectangular array(i.e. arrangements of numbers or functions)such as

$$A=\begin{bmatrix} 2 & cosx & \sqrt{3} \\ 1.1 & 4 & 0 \end{bmatrix}$$

Matrices are represented by capital letter A,B,C..etc.

The numbers or functions in a matrix are called elements of the matrix. The elements in the above example are 2, cosx, $\sqrt{3}$,1.1, 4 and 0.

A horizontal line of elements is called **row** of the matrix and the vertical line is called **column** of the matrix. The matrix in the above example has two rows and three columns.

ORDER OF THE MATRIX: A matrix having m rows and n columns is called a matrix of order m×n.

The matrix in the above example has order 2× 3.

Order of the matrix C =$\begin{bmatrix} 1 & 2 \\ -1 & 2 \\ 0 & 5 \end{bmatrix}$ is 3×2.

Order of the matrix A= $\begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix}$ is _________

In general , a m×n matrix is written as A= $\begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix}$

Matrix can be written in compact form as $A=[a_{ij}]_{m \times n}$. the number of elements in m×n matrix is mn.

The element a_{ij} is in the i^{th} row and j^{th} column and it is called $(I,j)^{th}$ element.

TYPES OF MATRICES:

1. **ROW MATRIX**: A matrix having one row only.

   Example A=$\begin{bmatrix} -7 & \sqrt{2} & 1 \end{bmatrix}$

2. **COLUMN MATRIX**: A matrix having one column only.

   Example: B= $\begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix}$

3. **SQUARE MATRIX**: A matrix is said to be square if it has same number of rows and columns.

   For example: A=$\begin{bmatrix} 1 & 5 \\ -9 & 2 \end{bmatrix}$ or B=$\begin{bmatrix} 1 & 1 & 3 \\ 8 & 0 & -5 \\ 7 & 8 & 99 \end{bmatrix}$

   The elements a_{11}, a_{22}, a_{33}….. are called diagonal elements . The line along which the diagonal elements lie is called principal diagonal.

4. **DIAGONAL MATRIX**: it is a square matrix in which all diagonal elements are non zero and rest all zeros.

   Ex: $C=\begin{bmatrix}1 & 0 & 0\\ 0 & 6 & 0\\ 0 & 0 & 9\end{bmatrix}$ = diag (1,6,9)

5. **SCALAR MATRIX**: A square matrix is called scalar if diagonals elements are same and rest all zeros.

   For ex: $X=\begin{bmatrix}4 & 0 & 0\\ 0 & 4 & 0\\ 0 & 0 & 4\end{bmatrix}$

   In other words , a scalar matrix is a diagonal matrix with identical diagonal elements.

6. **IDENTITY MATRIX (Unit Matrix):** A square matrix is called identity matrix or unit matrix if all the non diagonal elements are zero and diagonals elements are unity.

   The identity matrix of order n is denoted by I_n.

   For ex: $I_2=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ and $I_3=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$ are identity matrices of order 2 and 3.

7. **NULL/ZERO MATRIX:** A matrix whose all elements are zero is called null matrix or zero matrix .it is denoted by O.

   For ex : $O=\begin{bmatrix}0 & 0 & 0\\ 0 & 0 & 0\\ 0 & 0 & 0\end{bmatrix}$. It can be of any order.

8. **UPPER TRIANGULAR MATRIX:** A square matrix A is said to be an upper triangular matrix if all the elements lying below the main diagonal are zero. ie. If $a_{ij}=0$ for all $i>j$.

   for ex: $A=\begin{bmatrix}1 & 5 & 5\\ 0 & 4 & 6\\ 0 & 0 & 9\end{bmatrix}$.

9. **LOWER TRIANGULAR MATRIX:** A square matrix A is said to be an lower triangular matrix if all the elements lying above the principal diagonal are zero. ie. If $a_{ij}=0$ for all $i<j$.

   for ex: $A=\begin{bmatrix}1 & 0 & 0\\ 3 & 4 & 0\\ 7 & 8 & 9\end{bmatrix}$

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ASSIGNMENT-1

1. **let A=** $\begin{bmatrix} 3 & -7 & -3 \\ \sqrt{3} & 55 & 2.5 \\ 1 & 0 & 6 \end{bmatrix}$ **be any matrix**

   Write i) order of matrix ii) number of elements iii) elements a_{12}, a_{32} ,a_{21}.

2. **If a matrix has 18 elements, what are the possible orders it can have? What if it has 11 elements?**
3. **construct a 3×4 matrix A=[a_{ij}] ,whose elements are given by $a_{ij} = \frac{|i-j|}{2}$**
4. **Write the element a_{12}, a_{22} of matrix A=[a_{ij}]whose elements a_{ij} are given by $a_{ij}= e^{2ix}$sinjx.**
5. **construct a 3×4 matrix whose elements are given by $a_{ij} = \begin{cases} i+j & if\ i \geq j \\ \frac{1}{2(i-j)} & if\ i < j \end{cases}$**
6. **Write the number of all possible matrices of order 2×3 with each entry 1 or 2.**
7. **What is the number of all possible matrices of order 3×3 with each entry 9 or 8 ?**
8. **write the number of all possible matrices of order 2×2 with each entry 2, 3,or 4.**
9. **Give an example of : i) scalar matrix ii) diagonal matrix iii) row matrix which is also a column matrix**
10. **If A=** $\begin{bmatrix} 3 & 2 & 0 \\ -1 & 1.5 & 4 \\ 7 & 1 & 2 \end{bmatrix}$ **and B=** $\begin{bmatrix} 0 & 22 & 8 \\ 7 & 2 & 5 \\ 8 & 0 & 2 \end{bmatrix}$**,then find $a_{22}+b_{21}$.**

EQUALITY OF MATRICES:

Two matrices A and B are said to be equal if their order is same and corresponding elements are equal

i.e $a_{ij}=b_{ij}$. If A and B are equal matrices, then we write A=B. Otherwise we write A≠B

ASSIGNMENT-2

1. **Find the values of x, y and z if** $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$

2. **Find the value of x if** $\begin{bmatrix} 3x+y & -y \\ 2y-x & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -5 & 3 \end{bmatrix}$

3. **Write the value of x-y+z from the equation:** $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$
4. **Find the values of a and b if A=B, where A=** $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}$ $and\ B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$
5. **If A=** $\begin{bmatrix} cos\emptyset & -sin\emptyset \\ sin\emptyset & cos\emptyset \end{bmatrix}$**, then for what value of ∅ is A an identity matrix?**
6. **Find the values of a, b ,c and d from the equation:** $\begin{bmatrix} 2a+b & a-2b \\ 5c-d & 4c+3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$

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OPERATIONS ON MATRICES

ADDITION OF TWO MATRICES: Let A =$[a_{ij}]$ and B=$[b_{ij}]$ be two matrices of same order, then we define sum of matrices A and B as A+B= $[a_{ij}+b_{ij}]$.

In simple words, A+B is a matrix obtained by adding the corresponding elements of A and B.

Let A=$\begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ 0 & -2 \end{bmatrix}, C = \begin{bmatrix} 2 & 3 & 5 \\ 1 & 0 & -2 \end{bmatrix}$ then A+B=$\begin{bmatrix} 5 & 3 \\ -1 & 0 \end{bmatrix}$ but

A+C and B+C are not defined as their order is not same.

NOTE: i) If A and B are not of same order, then A+B is not defined.

ii) Matrix addition is commutative: A+B= B+A

iii) Matrix addition is associative: A+(B+C)= (A+B)+C

SUBTRACTION OF TWO MATRICES: Let A =$[a_{ij}]$ and B=$[b_{ij}]$ be two matrices of same order, then we define difference of matrices A nd B as A-B= $[a_{ij}-b_{ij}]$.

In simple words, A-B is a matrix obtained by subtracting the corresponding elements of A and B.

NOTE: If A and B are not of same order, then A-B is not defined.

Let A=$\begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ 0 & -2 \end{bmatrix}, C = \begin{bmatrix} 2 & 3 & 5 \\ 1 & 0 & -2 \end{bmatrix}$ then A-B=$\begin{bmatrix} -3 & 1 \\ -1 & 4 \end{bmatrix}$

but A-C and B-C are not defined as their order is not same.

SCALAR MULTIPLICATION (multiplication of a matrix by a scalar): Let A =$[a_{ij}]$ e a matrix of any order and let k be ay scalar, then we define multiplication of matrix A by scalar k as kA=$[ka_{ij}]$

In simple words, kA is a matrix obtained by multiplying each element of A by scalar k.

For ex: let A=$\begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$. Then 2A=2$\begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$= $\begin{bmatrix} 2 & 4 \\ -2 & 4 \end{bmatrix}$.

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ASSIGNMENT-3

1. **If A=**$\begin{bmatrix} -1 & 0 \\ 3 & 9 \end{bmatrix}$ $and\ B = \begin{bmatrix} 2 & -5 \\ -3 & 5 \end{bmatrix}$**, then find A+B, A-B, 3A**

2. **If A=**$\begin{bmatrix} -1 & 0 \\ 4 & 5 \end{bmatrix}$ $and\ B = \begin{bmatrix} 0 & -5 \\ -3 & 7 \end{bmatrix}$**,then find 3A-2B**
3. **If A= diag (-2,5,1) and B= diag(1,0,-4),then find 2A+B**
4. **Simplify: cosA**$\begin{bmatrix} cosA & sinA \\ -sinA & cosA \end{bmatrix}$**+ sinA**$\begin{bmatrix} sinA & -cosA \\ cosA & sinA \end{bmatrix}$
5. **If** $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$**, then find the matrix A**
6. **If A=**$\begin{bmatrix} 2 & -1 & 0 \\ -2 & 1 & 1 \end{bmatrix}$ **and B=** $\begin{bmatrix} 3 & -1 & 2 \\ -2 & 1 & -3 \end{bmatrix}$**,then find the matrix C: 5A+3B+2C is a null matrix.**
7. **Find the matrices X and Y if X+Y=** $\begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$**and X-Y =** $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$
8. **If X and Y are two square matrices if order2, find X and Y if 2X+3Y=**$\begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$ **and 3X+2Y=**$\begin{bmatrix} -2 & 2 \\ 1 & 5 \end{bmatrix}$

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MUTIPLICATION OF MATRICES

If A and B are two matrices , then product AB is defined if and only if the numbers of columns in A is equal to number of rows in B.

i.e. Number of columns of second matrix must be equal to number of rows of first matrix.

Note: The result will have the same number of rows as the 1st matrix, and the same number of columns as the 2nd matrix.

ASSIGNMENT-4

1. If A= $\begin{bmatrix} 2 & 1 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ and B= $\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$, find AB and BA (if exist)

2. Find the product of following:

i) $\begin{bmatrix} 0 & 2 \\ -2 & -5 \end{bmatrix} . \begin{bmatrix} 6 & -6 \\ 3 & 0 \end{bmatrix}$ $\qquad \begin{bmatrix} 6 & 0 \\ -27 & 12 \end{bmatrix}$

ii) $\begin{bmatrix} 6 \\ -3 \end{bmatrix} \begin{bmatrix} -5 & 4 \end{bmatrix}$ $\qquad \begin{bmatrix} -30 & 24 \\ 15 & -12 \end{bmatrix}$

iii) $\begin{bmatrix} -5 & -5 \\ -1 & 2 \end{bmatrix} . \begin{bmatrix} -2 & -3 \\ 3 & 5 \end{bmatrix}$ $\qquad \begin{bmatrix} -5 & -10 \\ 8 & 13 \end{bmatrix}$

iv) $\begin{bmatrix} 0 & 5 \\ -3 & 1 \\ -5 & 1 \end{bmatrix} . \begin{bmatrix} -4 & 4 \\ -2 & -4 \end{bmatrix}.$ $\qquad \begin{bmatrix} -10 & -20 \\ 10 & -16 \\ 18 & -24 \end{bmatrix}$

v) $\begin{bmatrix} 5 & 3 & 5 \\ 1 & 5 & 0 \end{bmatrix} . \begin{bmatrix} -4 & 2 \\ -3 & 4 \\ 3 & -5 \end{bmatrix}.$ $\qquad \begin{bmatrix} -14 & -3 \\ -19 & 22 \end{bmatrix}$

vi) $\begin{bmatrix} -4 & 2 \\ -3 & 4 \\ 3 & -5 \end{bmatrix} . \begin{bmatrix} 5 & 3 & 5 \\ 1 & 5 & 0 \end{bmatrix}.$ $\qquad \begin{bmatrix} -18 & -2 & -20 \\ -11 & 11 & -15 \\ 10 & -16 & 15 \end{bmatrix}$

2. If A= $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$ and B= $\begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & 1 \\ 2 & 3 & 4 \end{bmatrix}$ show that AB $\neq$ BA

3. Compute the product AB and BA where A= $\begin{bmatrix} 2 & -1 & 3 \\ 3 & 2 & 4 \end{bmatrix}$ and B= $\begin{bmatrix} -1 & 2 \\ 2 & -4 \\ 3 & -5 \end{bmatrix}$

4. find A^2, if i) A= $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ ii) A= $\begin{bmatrix} -1 & 1 & 2 \\ 3 & 0 & 1 \\ 2 & -3 & 4 \end{bmatrix}$ iii) A= $\begin{bmatrix} 5 & 3 & 5 \\ 1 & 5 & 0 \end{bmatrix}$.

5. If A= $\begin{bmatrix} cos\emptyset & -sin\emptyset \\ sin\emptyset & cos\emptyset \end{bmatrix}$, Find A^2.

6. if $\begin{bmatrix} 3 & 4 \\ 2 & x \end{bmatrix} \begin{bmatrix} x \\ 1 \end{bmatrix} = \begin{bmatrix} 19 \\ 12 \end{bmatrix}$, find the value of x.

7. A = $\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, evaluate A^2 .

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ASSIGNMENT-5

1. If $x\begin{bmatrix}2\\3\end{bmatrix}+y\begin{bmatrix}-1\\1\end{bmatrix}=\begin{bmatrix}10\\5\end{bmatrix}$

2. If $\begin{bmatrix}1 & 0\\y & 5\end{bmatrix} + 2\begin{bmatrix}x & 0\\1 & -2\end{bmatrix} = I_2$, find x and y.

3. 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.

4. Find the value of x , if $\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\2 & 5 & 1\\15 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\2\\x\end{bmatrix} = 0$.

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

6. If $F(x)= \begin{bmatrix}cosx & -sinx & 0\\sinx & cosx & 0\\0 & 0 & 1\end{bmatrix}$, show that F(x).F(y)= F(x+y)

7. Show that the matrix $A = \begin{bmatrix}2 & 3\\1 & 2\end{bmatrix}$ satisfies the equation $A^2 - 4A + I = O$, where I is 2 x 2 identity matrix and O is 2 x 2 zero matrix.

8. If $A = \begin{bmatrix}0 & -tan\frac{\alpha}{2}\\tan\frac{\alpha}{2} & 0\end{bmatrix}$ and I is the identity matrix of order 2, Show that $I + A = (I-A)\begin{bmatrix}cos\alpha & -sin\alpha\\sin\alpha & cos\alpha\end{bmatrix}$

9. Let $A = \begin{bmatrix}2 & -4\\7 & 8\end{bmatrix}$, $B = \begin{bmatrix}5 & 2\\7 & 4\end{bmatrix}$ and $C = \begin{bmatrix}2 & 5\\3 & 8\end{bmatrix}$. Find a matrix D such that CD – AB = O .

10. Let the two matrices A and B be given by $A = \begin{bmatrix}1 & -1 & 0\\2 & 3 & 4\\0 & 1 & 2\end{bmatrix}$ and $B = \begin{bmatrix}2 & 2 & -4\\-4 & 2 & -4\\2 & -1 & 5\end{bmatrix}$.

    Verify AB = BA = 6I

11. Find the matrix X such that $\begin{pmatrix}2 & -1\\0 & 1\\-2 & 4\end{pmatrix}X = \begin{pmatrix}-1 & -8 & -10\\3 & 4 & 0\\10 & 20 & 10\end{pmatrix}$

12. A trust fund has Rs 30000to invest in two bond first pays 5% interest per year and second pays 7% using matrix multiplication determine how to divide Rs 30000 among two type of boards if trust must obtain annual interest of Rs 2000.

13. In a department store a customer x purchases 2 packets of tea, 4 kg of rice and 5 dozen oranges. Customer y purchases 1 packet of tea .5 kg rice and 24 oranges. Price on 1 pack of tea is Rs 54, 1kg rice is Rs 22 and that of one dozen orange is Rs 24 . Use matrix multiplication method and calculate each individual bill.

14. A manufacturer produces three products x, y, z which he sells in two markets .

Annual sales one indicated

Market	Produces		
	X	y	z
I	10000	2000	18000
II	6000	20000	8000

Of unit sale price of x, y and z are rs 2.50,rs 1.50 and rs 1.00 respectively find the total revenue in each market using matrices.

15. If A= $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that: $A^3-6A^2+7A+2I=0$
16. If A=$\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, show that $A^3=4A$
17. Find the value of x for which $\begin{bmatrix} x & 4 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 2 \\ 0 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ 3 \\ 1 \end{bmatrix}=0$

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TRANSPOSE OF A MATRIX

The matrix obtained by interchanging the rows and columns of a matrix A is called transpose of the matrix and is denoted by A^T or $A^/$.

If A= $\begin{bmatrix} 2 & 3 & 4 \\ 1 & 6 & 5 \end{bmatrix}$ then $A^/$ = $\begin{bmatrix} 2 & 1 \\ 3 & 6 \\ 4 & 5 \end{bmatrix}$

Properties of transpose of the matrices

(i) $(A^/)^/ = A$

(ii) $(kA)^/ = kA^/$ where k is any constant

(iii) $(A+B)^/ = A^/+B^/$.

(iv) $(AB)^/ = B^/A^/$.

Eg. If A= $\begin{bmatrix} 2 & 3 & 4 \\ 1 & 6 & 5 \end{bmatrix}$ and B= $\begin{bmatrix} 1 & 3 & 2 \\ 2 & 3 & -3 \end{bmatrix}$, verify that

(i) $(A^/)^/ = A$

(ii) $(kA)^/ = kA^/$ where k is any constant

(iii) $(A+B)^/ = A^/+B^/$.

Eg. If A= $\begin{bmatrix} 2 & -4 \\ 7 & 8 \end{bmatrix}$ and B= $\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$ verify that $(AB)^/ = B^/A^/$.

Verify that $(AB)^/ = B^/A^/$.

i) A= $\begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$ and B= $\begin{bmatrix} 1 & 4 & -2 \end{bmatrix}$

ii) If A = $\begin{bmatrix} 1 & 1 & 0 \\ -2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and B= $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

SYMMETRIC AND SKEW SYMMETRIC MATRICES

A square matrix A is said to be **symmetric** if $A^/=A$, i.e. $a_{ij}=a_{ji}$ for all possible values of i and j

For eg: A= $\begin{bmatrix} \sqrt{3} & 5 & -2 \\ 5 & 14 & 6 \\ -2 & 6 & 10 \end{bmatrix}$ is a symmetric matrix as $A^/=A$

A square matrix A is said to be **skew symmetric** if $A^/= -A$, i.e. $a_{ij} = -a_{ji}$ for all possible values of i and j and $a_{ii}=0$

For eg: A= $\begin{bmatrix} 0 & 5 & 2 \\ -5 & 0 & 6 \\ -2 & -6 & 0 \end{bmatrix}$ is a symmetric matrix as $A^/= -A$

Note: diagonals elements of a skew symmetric matrix are zero.

Some important results:

1. **For any square matrix A , $A+A^/$ is always symmetric.** A= $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

2. **For any square matrix A , $A-A^/$ is always skew symmetric.** A= $\begin{bmatrix} 2 & 3 \\ 3 & -4 \end{bmatrix}$

3. **Every square matrix can be uniquely expressed as s sum of symmetric and skew symmetric matrix**.

Assignment-6

1. **Express the matrix A= $\begin{bmatrix} 2 & 2 & 4 \\ -4 & 2 & -4 \\ 2 & -10 & 5 \end{bmatrix}$ as a sum of symmetric and skew symmetric matrix.**
2. **Express the matrix $\begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as sum of symmetric and skew symmetric matrix.**
3. **Find the values of x, y, z if A = $\begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies the eqn $A^/A = I$.**
4. **Find x if $[x \quad 4 \quad -1] \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & 0 \\ 2 & 2 & 4 \end{bmatrix} [x \quad 4 \quad -1]^T = 0$.**
5. **A = $\begin{bmatrix} 3 & 2 \\ -1 & 1 \end{bmatrix}$, B = $\begin{bmatrix} -1 & 0 \\ 2 & 5 \\ 3 & 4 \end{bmatrix}$, find $(BA)^T$.**
6. **If A and B are symmetric matrices of same order, write whether AB – BA is symmetric or skew symmetric.**
7. **A = $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then write whether AA^T is O or I .**
8. **Find x, if $\begin{pmatrix} 5 & 3x \\ 2y & z \end{pmatrix} = \begin{pmatrix} 5 & 4 \\ 12 & 6 \end{pmatrix}^T$**
9. **Define symmetric matrix and skew symmetric matrix. Give an example of each.**