

GIRLS' HIGH SCHOOL AND COLLEGE

2020 – 2021

CLASS - 12 B & C

MATHEMATICS

WORKSHEET NO. 2

CHAPTER: MATRICES

**Note:** Parents kindly instruct your ward to visit the relevant website [www.khanacademy.org](http://www.khanacademy.org) [www.topperlearning.com](http://www.topperlearning.com) or refer ISc Mathematics for class 12 by OP Malhotra. The student should go through the topics first for at least 2 to 3 days and then attempt the questions.

**Transpose Matrix :** The matrix obtained from any given matrix A by interchanging its row and the column is called transpose matrix and is denoted as  $A'$  or  $A^t$ . Thus if the order of the matrix A is  $m \times n$  then the order of the matrix  $A^t$  is  $n \times m$ .

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Let  $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$  then  $A' = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$  this shows that the elements of the first row ( 2 3) of matrix A is written in the first column of matrix  $A'$  and the elements of the second row ( 4 5) into the second column. ( shown by an arrow ).

*Properties of transpose matrix :*

Let A and B are the suitable matrices, then

- |                           |                                      |
|---------------------------|--------------------------------------|
| i. $(A')' = A$            | (iv) $(A - B)' = A' - B'$            |
| ii. $(-A)' = -A'$         | (v) $(AB)' = B'A'$                   |
| iii. $(A + B)' = A' + B'$ | (vi) $(kA)' = kA'$ where k is scalar |

**Solve the following questions based on the above properties:**

- If matrix  $A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$ , write  $AA'$ , where  $A'$  is the transpose of matrix A.
- If  $A = \begin{bmatrix} -1 & 5 \\ 3 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & -2 \\ 5 & 4 \end{bmatrix}$ , verify that
  - $(A + B)' = A' + B'$
  - $(3A)' = 3A'$
- If  $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ ,  $0 < x < \pi/2$  and  $A + A' = \sqrt{2} I$ , then find the value x.
- Find the values of x, y and z if the matrix  $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$  satisfy the equation  $A'A = I_3$
- If  $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & 2 & 1 \end{bmatrix}$ , verify that  $(AB)' = B'A'$
- If  $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$  is a matrix satisfying  $AA^t = 9 I_3$ , then find the values of a and b.
- Find the integral value of x if  $\begin{bmatrix} x & 4 & -1 \end{bmatrix} \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & 0 \\ 2 & 2 & 4 \end{bmatrix} \begin{bmatrix} x & 4 & -1 \end{bmatrix}^t = 0$