Exercise 1.2

Q.1 Identify the following matrices.

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

It's all members are 0. So, it's a null matrix.

$$B=\begin{bmatrix}2 & 3 & 4\end{bmatrix}$$

It has only 1 row. So, it's a row matrix.

$$C=\begin{bmatrix}4\\ 0\\ 6\end{bmatrix}$$

It has only 1 column. So, it's a column matrix.

$$D=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

It is an identity matrix because its diagonal entries are 1 and non-diagonal entries are zero.

$$E=\begin{bmatrix}0\end{bmatrix}$$

It has only 0. So, it's a null matrix.

$$F=\begin{bmatrix}5\\ 6\\ 7\end{bmatrix}$$

It has only 1 column. So, it's a column matrix.

Q.2 Identify the following matrices.

(1) $$\begin{bmatrix}-8 & 2 & 7\\ 12 & 0 & 4\end{bmatrix}$$

Its number of rows & columns are not equal. So, it's a rectangular matrix.

(2) $\begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}$

It has only one column. So, it's a column matrix.

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

The number of rows & columns are equal. So, it's a square matrix.

(4) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Identity matrix – Because Diagonal entries are 1 and non-diagonal entries are 0.

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

Number of rows & columns are not equal. So, it's a rectangular matrix.

(6) $\begin{bmatrix} 3 & 10 & -1 \end{bmatrix}$

It's a row matrix because it has only 1 row.

(7) $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

Column matrix because it has only one column.

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

Square matrix because number of rows & columns are equal.

(9) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$

Null matrix because all elements are 0.

Q.3 Identify the matrices.

(1) $A = \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

Scalar- matrix because it non-diagonal entries are 0 & diagonal entries are same.

(2) $B = \begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix}$

Diagonal matrix because its non-diagonal entries are 0.

(3) $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Unit matrix because diagonal-entries are 1.

(4) $D = \begin{bmatrix} 3 & 0 \\ 0 & 0 \end{bmatrix}$

Diagonal matrix because non-diagonal are 0.

(5) $E = \begin{bmatrix} 5-3 & 0 \\ 0 & 1+1 \end{bmatrix}$

Scalar- because diagonal are same.

Q.4 Find the negative of matrices.

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

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

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

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

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

(3) $C = \begin{bmatrix} 2 & 6 \\ 3 & 2 \end{bmatrix}$

$$-C = -\begin{bmatrix} 2 & 6 \\ 3 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & -6 \\ -3 & -2 \end{bmatrix}$$

(4) $D = \begin{bmatrix} -3 & 2 \\ -4 & 5 \end{bmatrix}$

$$-D = -\begin{bmatrix} -3 & 2 \\ -4 & 5 \end{bmatrix}$$

$$= \begin{bmatrix} +3 & -2 \\ +4 & -5 \end{bmatrix}$$

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

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

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

Q.5 Find the transpose.

(1) $A = \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix}$

$$A^t = \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix}^t$$
$$A^t = \begin{bmatrix} 0 & 1 & -2 \end{bmatrix}$$

(2) $B = \begin{bmatrix} 5 & 1 & -6 \end{bmatrix}$
$$B^t = \begin{bmatrix} 5 & 1 & -6 \end{bmatrix}^t$$
$$B^t = \begin{bmatrix} 5 \\ 1 \\ -6 \end{bmatrix}$$

(3) $C = \begin{bmatrix} 1 & 2 \\ 2 & -1 \\ 3 & 0 \end{bmatrix}$
$$C^t = \begin{bmatrix} 1 & 2 \\ 2 & -1 \\ 3 & 0 \end{bmatrix}^t$$
$$C^t = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 0 \end{bmatrix}$$

(4) $D = \begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix}$
$$D^t = \begin{bmatrix} 2 & 3 \\ 0 & 5 \end{bmatrix}^t$$
$$D^t = \begin{bmatrix} 2 & 0 \\ 3 & 5 \end{bmatrix}$$

(5) $E = \begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix}$
$$E^t = \begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix}^t$$
$$E^t = \begin{bmatrix} 2 & -4 \\ 3 & 5 \end{bmatrix}$$

(6) $F = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
$$F^t = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}^t$$
$$F^t = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

Q.6 Verify if $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ **and** $B = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$

(i) $(A^t)^t = A$

Solution: $(A^t)^t = A$
$$A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$
$$A^t = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}^t$$
$$A^t = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$$
$$\left(A^t\right)^t = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}^t$$
$$\left(A^t\right)^t = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$
$$\left(A^t\right)^t = A$$
Hence Proved.

(ii) $\left(B^t\right)^t = B$

Solution: $\left(B^t\right)^t = B$
$$B = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$$
$$B^t = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}^t$$
$$B^t = \begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}$$
$$\left(B^t\right)^t = \begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}^t$$
$$\left(B^t\right)^t = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$$

$\left(B^t\right)^t = B$

Hence proved

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Report any mistake at freeilm786@gmail.com