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.

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

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

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

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

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

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

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

$$B^t = \begin{bmatrix} 5 \\ 1 \\ -6 \end{bmatrix}$$

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

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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