

2) Find the rank of the given matrix:

$$\begin{bmatrix} 1 & 1 & 0 & -2 \\ 2 & 0 & 2 & 2 \\ 4 & 1 & 3 & 1 \end{bmatrix}$$

Solution: $\begin{bmatrix} 1 & 1 & 0 & -2 \\ 2 & 0 & 2 & 2 \\ 4 & 1 & 3 & 1 \end{bmatrix}$

$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 1 & 0 & -2 \\ 0 & -2 & 2 & 6 \\ 0 & -3 & 3 & 9 \end{bmatrix}$$

$$R_2 \rightarrow R_2 / 2$$

$$\begin{bmatrix} 1 & 1 & 0 & -2 \\ 0 & 1 & 1 & -3 \\ 0 & -3 & 3 & 9 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 3R_2$$

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

Number of non-zero rows = 2

Rank of matrix = 2