Assignment

$$A = \begin{pmatrix} 2 & 0 & 1 \\ 3 & 4 & 8 \\ 7 & 2 & -3 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 & -1 & 5 \\ 4 & 2 & 8 \\ 7 & 3 & 0 \end{pmatrix}$$

$$C = \begin{pmatrix} 2 & 3 & 7 \\ 1 & 8 & -2 \\ 9 & 6 & 4 \end{pmatrix}$$

The linear transformation Of A if vector $x = (a, b, c)$

$$\begin{pmatrix} 2 & 0 & 1 \\ 3 & 4 & 8 \\ 7 & 2 & -3 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$a \begin{pmatrix} 2 \\ 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 0 \\ 4 \\ 2 \end{pmatrix} b + c \begin{pmatrix} 1 \\ 8 \\ -3 \end{pmatrix}$$

$$\begin{matrix} 2a & + & & + & c \\ 3a & + & 4b & + & 8c \\ 7a & & 2b & & -3c \end{matrix}$$

$$= \begin{pmatrix} 2a + c \\ 3a + 4b + 8c \\ 7a + 2b - 3c \end{pmatrix}$$

② $B = \begin{pmatrix} 1 & -1 & 5 \\ 4 & 2 & 8 \\ 7 & 3 & 0 \end{pmatrix}$ + $C = \begin{pmatrix} 2 & 3 & 7 \\ 1 & 8 & -2 \\ 9 & 6 & 4 \end{pmatrix}$

$$B+C = \begin{pmatrix} 3 & 2 & 12 \\ 5 & 10 & 6 \\ 16 & 9 & 4 \end{pmatrix}$$

$$(B+C)^T = \begin{pmatrix} 3 & 5 & 16 \\ 2 & 10 & 9 \\ 12 & 6 & 4 \end{pmatrix}^T$$

Saution

$$(B+C)^T = \begin{bmatrix} 3 & 5 & 16 \\ 2 & 10 & 9 \\ 12 & 6 & 4 \end{bmatrix}$$

now reduce this matrix interchanging Rows $R_1 \Leftrightarrow$

$$= \begin{bmatrix} 12 & 6 & 4 \\ 2 & 10 & 9 \\ 3 & 5 & 16 \end{bmatrix}$$

$R_1 \Leftarrow R_1 \div 12$

$$= \begin{bmatrix} 1 & 0.5 & 0.3 \\ 2 & 10 & 9 \\ 3 & 5 & 16 \end{bmatrix}$$

$R_2 \leftarrow R_2 - 2 \times R_1$

$$= \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0 & 9 & 8.3 \\ 3 & 5 & 16 \end{bmatrix}$$

$R_3 \leftarrow R_3 - 3 \times R_1$

$$\begin{bmatrix} 1 & 0.5 & 0.3 \\ 0 & 9 & 8.33 \\ 0 & 3.5 & 15 \end{bmatrix}$$

$R_2 \leftarrow R_2 \div 9$

$$\begin{bmatrix} 1 & 0.5 & 0.3 \\ 0 & 1 & 0.9 \\ 0 & 3.5 & 15 \end{bmatrix}$$

$R_3 \leftarrow R_3 - 3.5 \times R_2$

$$= \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0 & 1 & 0.9 \\ 0 & 0 & 11.8 \end{bmatrix}$$

$R_3 \leftarrow R_3 \times 0.085$

$$= \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0 & 1 & 0.93 \\ 0 & 0 & 1 \end{bmatrix}$$

The rank of a Matrix is the number of non null zeros

Rank = 3

③ Check whether A, B and C are singular or non singular

$$A = \begin{pmatrix} 2 & 0 & 1 \\ 3 & 4 & 8 \\ 7 & 2 & -3 \end{pmatrix}$$

$$|A| = \begin{vmatrix} 2 & 0 & 1 \\ 3 & 4 & 8 \\ 7 & 2 & -3 \end{vmatrix}$$

$$2 \times \begin{vmatrix} 4 & 8 \\ 2 & -3 \end{vmatrix} + 0 \begin{vmatrix} 3 & 8 \\ 7 & -3 \end{vmatrix} + 1 \times \begin{vmatrix} 3 & 4 \\ 7 & 2 \end{vmatrix}$$

$$2\times(-12-16) + 0\times(-9-56) + \cancel{1\times 6}(\ 1\times(6-28)$$

$$= 2(-28) + 0\times(-65) + 1\times(-22$$

$$= -56 + 0 - 22$$

$$= -78$$

$$= \begin{pmatrix} 1 & -1 & 5 \\ 4 & 2 & 8 \\ 7 & 3 & 0 \end{pmatrix}$$

$$|A| = \begin{vmatrix} 1 & -1 & 5 \\ 4 & 2 & 8 \\ 7 & 3 & 0 \end{vmatrix}$$

$1 \times \begin{vmatrix} 2 & 8 \\ 3 & 0 \end{vmatrix} + 1\times \begin{vmatrix} 4 & 8 \\ 7 & 0 \end{vmatrix} + 5\times \begin{vmatrix} 4 & 2 \\ 7 & 3 \end{vmatrix}$

$1 \times (0-24) + 1\times(0-56) + 5\times(12-14)$

$1 \times (-24) + 1 \times (-56) + 5\times(-2)$

$= -24 - 56 - 10$

$= -90$ It is non-singular matrix

)

$C = \begin{vmatrix} 2 & 3 & 7 \\ 1 & 8 & -2 \\ 9 & 6 & 4 \end{vmatrix}$

$|C| = \begin{vmatrix} 2 & 3 & 7 \\ 1 & 8 & -2 \\ 9 & 6 & 4 \end{vmatrix}$

$= 2\times \begin{vmatrix} 8 & -2 \\ 6 & 4 \end{vmatrix} - 3\times \begin{vmatrix} 1 & -2 \\ 9 & 4 \end{vmatrix} + 7\times \begin{vmatrix} 1 & 8 \\ 9 & 6 \end{vmatrix}$

$\cancel{2\times(8\times4} -$

$2\times(32+12) - 3\times(4+18) + 7\times(6-72)$

$= 2\times 44 - 3\times 22 + 7\times(-66)$

$= 88 - 66 - 462$

$= -440$

It is non-singular matrix