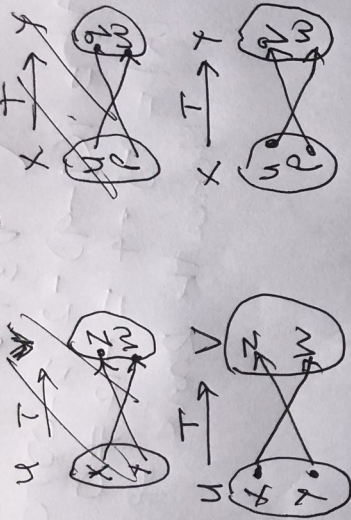


① Linear transformation is the mapping of elements of the domain to the codomain. eg



$$A = \begin{bmatrix} 1 & 9 & 3 \\ -2 & 6 & 7 \\ 0 & -1 & 3 \end{bmatrix} \quad x = \begin{bmatrix} 1 \\ 4 \\ -8 \end{bmatrix}$$

$$T(x) = A(x)$$

$$T(x) = \begin{bmatrix} 1 & 9 & 3 \\ -2 & 6 & 7 \\ 0 & -1 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 4 \\ -8 \end{bmatrix} = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix} + 4 \begin{bmatrix} 9 \\ 6 \\ -1 \end{bmatrix} + (-8) \begin{bmatrix} 3 \\ 7 \\ 3 \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix} + \begin{bmatrix} 36 \\ 24 \\ -4 \end{bmatrix} + \begin{bmatrix} -24 \\ -56 \\ -24 \end{bmatrix}$$

$$T(x) = \begin{bmatrix} 13 \\ -34 \\ -28 \end{bmatrix}$$

② Rank of a matrix A is the order of the largest square matrix or submatrix of A whose determinant is not equal to zero.