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Questions

- (1) Define the following (i) linear transformation (ii) Rank of a matrix.
- (2) Given a matrix X where the first column is 1, 4, 9, the second column is 2, 7, 5 & the third column is 8, 6, 3. Determine whether it is singular or non singular.
- (3) Let T maps X to Y be a linear transformation. Let the elements in domain X be e, f, g, h, i, j, k and let the elements in co-domain Y be 2, 4, 6, 8, 10. Transform 5 elements in domain X to 5 elements in co-domain Y .

ANSWER

- (i) Linear transformation is a function from one vector space to another that respects the underlying (linear) structure of each vector space. It is also known as a linear operator or map.
- (ii) Rank of a matrix is defined as the maximum number of linear independent column vectors in the matrix or (b) the maximum number of linear independent row vectors in the matrix.

2)

first column $(C_1) = 1, 4, 9$

Second column $(C_2) = 2, 7, 5$

Third column $(C_3) = 8, 6, 3$

$$X = \begin{bmatrix} 1 & 2 & 8 \\ 4 & 7 & 6 \\ 9 & 5 & 3 \end{bmatrix}$$

$$|X| = 1 \cdot \begin{vmatrix} 7 & 6 \\ 5 & 3 \end{vmatrix} - 2 \cdot \begin{vmatrix} 4 & 6 \\ 9 & 3 \end{vmatrix} + 8 \cdot \begin{vmatrix} 4 & 7 \\ 9 & 5 \end{vmatrix}$$

$$(21 - 30) - 2(12 - 54) + 8(20 - 63)$$

$$-9 - 2(-42) + 8(-43)$$

$$-9 + 84 + (-344)$$

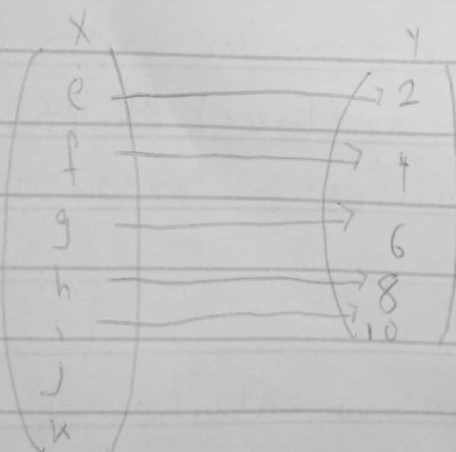
$$|X| = -269$$

\therefore Therefore matrix is non-singular!!

3.) $T: X \rightarrow Y$

domain

co-domain



$d: x, h, j, k$

Transforming

Transforming

x
2
4
6
8
10
~~12~~
K

domain

y
A
e
f
g
h
i

Co-domain