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18/SCI01/074

1. (i) Linear transformation T: U → V

V is a function that carries element of the vector space U (domain) to vector space V (co-domain) and has two properties:

(a) Additive property: $T(U_1 + U_2) = T(U_1) + T(U_2)$

(b) Multiplicative property: $T(\alpha U) = \alpha T(U)$

(ii) Rank of a matrix

This is the dimension of the vector space generated by it's columns. It is also the maximum number of linearly independent column vectors in the matrix.

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

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

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

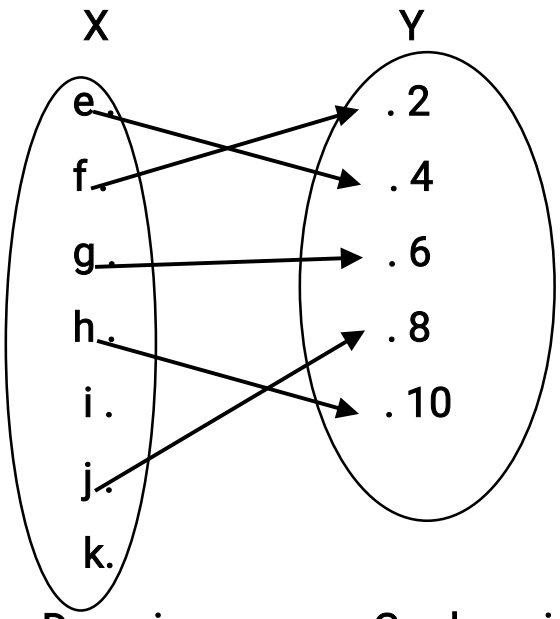
$/X/ = 1(21 - 30) - 2(12 - 54) + 8(20 - 63)$

/X/ = - 9 + 84 – 344

/X/ = - 269

/X/≠ 0 , therefore X is a non-singular matrix

3. T: X ⟶ Y



T(e) = 4

T(f) = 2

T(g) = 6

T(h) = 10

T(j) = 8