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QUESTION 1

Linear transformation is a function that carries elements of the vector space V (called domain) to the vector space W (called codomain) and which has two additional properties

- $T(u_1 + v_2) = T(u_1) + T(v_2)$ for all $u_1, u_2 \in U$
- $T(\alpha u) = \alpha T(u)$ for all $u \in U$ and all $\alpha \in \mathbb{R}$

QUESTION 2

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

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

$$T(x) = \begin{bmatrix} 2 \\ 10 \\ 4 \end{bmatrix} + \begin{bmatrix} 2 \\ 10 \\ 11 \end{bmatrix} + \begin{bmatrix} -8 \\ -9 \\ -5 \end{bmatrix}$$

$$T(x) = \begin{bmatrix} -4 \\ 11 \\ 10 \end{bmatrix}$$

QUESTION 3

The Rank of a matrix is defined as the maximum number of linearly independent column vectors in the matrix or the maximum number of linearly independent row vectors in the matrix