

Quiz 8 Linear Transformation II.

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Consider a linear transformation L defined by the formula $L(X) = AX$ where

$$A = \begin{bmatrix} 4 & 6 & 10 \\ 6 & 9 & 15 \end{bmatrix}.$$

Answer the following questions.

1. Determine the REF of A using the standard algorithm to calculate the rank of A . **Answer:** $\begin{bmatrix} 4 & 6 & 10 \\ 0 & 0 & 0 \end{bmatrix} X$. The $rank(A)$ is 1.
2. If L is interpreted as a transformation from \mathfrak{R}^n to \mathfrak{R}^m , determine the values of n, m . **Answer:** Since $A = 2 \times 3$, we have $m = 2$ and $n = 3$.
3. Determine if the transformation L is injective. Give a brief reason. **Answer:** Since $rank(A) = 1 < colnum(A)$ the transformation is not injective.
4. Determine if the transformation L is surjective. Give a brief reason. **Answer:** Since $rank(A) = 1 < rownum(A)$ the transformation is not surjective.
5. **For meditation** L is not injective, iff you have a nonzero X such that $AX = 0$. Similarly L is not surjective, iff you have a vector Y (in the codomain) such that $Y \neq AX$ for any X in the domain. **Answer:** Think...