

Problem 1: Find the values of h for which the vectors are linearly dependent.

$$\begin{bmatrix} 1 \\ -1 \\ 4 \end{bmatrix} \quad \begin{bmatrix} 3 \\ -5 \\ 7 \end{bmatrix} \quad \begin{bmatrix} -1 \\ 5 \\ h \end{bmatrix}$$

Problem 2: Show that the transformation T defined by the following are not linear

(1) $T(x_1, x_2) = (4x_1, -2x_2, 3|x_2|)$

(2) $T(x_1, x_2) = (2x_1 - 3x_2, x_1 + 4, 5x_2)$

Problem 3: If the columns of a $n \times n$ matrix A span \mathbb{R}^n .

show that for A^2 , the columns of it is linearly independent

Problem 4: Quick Questions

(1) Are these vectors linearly dependent? $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

(2) Are these vectors linearly dependent? $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 2 \\ 5 \\ 3 \\ 9 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} \quad \begin{bmatrix} 5 \\ 0 \\ 1 \end{bmatrix}$

(3) $A_{m \times n}$. $AX = b$ has at most 1-solution for each $b \in \mathbb{R}^m$

then - the columns of A is linearly independent True or False?

(4) $T: \mathbb{R} \rightarrow \mathbb{R}$ defined by $Tx = ax + b$. when does T become a linear Transformation?

(5) T linear transformation maps \mathbb{R}^n onto \mathbb{R}^m if the columns of A span \mathbb{R}^m

True or False?

) $T(x_1, x_2) = (-5x_1 + 9x_2, 4x_1, -7x_2)$ Find T^{-1} ? (Hint. Find the matrix of T)

) If E, F are $n \times n$ matrix. and $EF = I$

then $FE = I$. True or False?

(Hint. if F is invertible. then what's your conclusion?)