Week 5 Day 2

Linear Or Not

Make sure you know your neighbors' names. Then take about 2 minutes to discuss:

Is the function $T : \mathbb{R}^2 \to \mathbb{R}^2$ given by

$$T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \ln(e^x e^y) \\ \sin^2(x) + \cos^2(x) - 1 \end{bmatrix}$$

linear?

Dimension

1. A 3×7 matrix has rank 3. Which of the following is true?

(A) Its columns are linearly independent.

(B) Its columns span.

(C) Its nullity is 4.

(D) None of the above OR more than one of the above.

2. Let

$$U = \{p \in \mathbb{P}_3 : p(2) = 0\},$$

ie, U is the set of polynomials $a + bt + ct^2 + dt^3$ which evaluate to 0 at $t = 2$. Which of the following is true about U?

(A) It is not a subspace of $\mathbb{P}_3$.

(B) It is a subspace, and $\dim(U) = 1$.

(C) It is a subspace, and $\dim(U) = 2$.

(D) None of the above.

3. What is the nullity of the following matrix?

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(A) 0

(B) 1

(C) 2

(D) None of the above