

PROBLEM #1.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

Proof:

All vectors in u are eigenvectors.

$$\forall u_i \in u: Tu_i \in \text{Span}(u_i)$$

Therefore all vectors in u are eigenvectors. \square .

PROBLEM #2.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$$

both u_1 and u_3 ,

$$Tu_i \in \text{Span}(u_i).$$

u_2 is not an eigenvector,

$$Tu_2 \notin \text{Span}(u_2).$$

PROBLEM #3.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$

u_1 is the only eigen vector

$$\forall u_i \in \{u_2, u_3\}: T u_i \notin \text{Span}(u_i).$$

PROBLEM #4.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

Answer is none.

PROBLEM #5.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

Answer is all.

PROBLEM #6.

Given vector set $u = \{u_1, u_2, u_3\}$ and the Transformation T , which vectors in u are eigenvectors?

$$u = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\} \quad T = \begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$$

Answer is only u_1 .