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Exercise 32, Linear Algebra: A Modern Introduction, 4th Edition

Solved by experts

Linear Algebra: A Modern Introduction, 4th Edition, Chapter 6: Vector Spaces

Exercise 32, Page 514

Exercise 32 Answer

Step by step explanation

HIDE ALL

Tip

- In this type of questions we need to find eigenvalues and eigenvectors.

Explanation

- We will take β as the standard basis of $\mathbb{R}^2$
- We will find $[T]_\beta$ with the help of standard basis.
- Eigenvalues does not exist as $\det([T]_\beta - \lambda I)$ do not have real roots.

- So, Basis C does not exist for T to be diagonalizable.

Step 1 of 1

Let, $\beta = \{e_1, e_2\}$ be the standard basis of $\mathbb{R}^2$.

$T(e_1) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

$T(e_2) = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$

Thus,

$[T]_\beta = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$

Eigenvalues of $[T]_\beta$:

$$\det([T]_\beta - \lambda I) = \det\left(\begin{bmatrix} 1-\lambda & -1 \\ 1 & 1-\lambda \end{bmatrix}\right)$$
$$= (1-\lambda)^2 - (-1)$$
$$= (1-\lambda)^2 + 1$$

$(1-\lambda)^2 + 1$ does not have any real roots. T_β does not have eigenvalue. Therefore, Basis C such that T is diagonalizable does not exist.

Final answer

In this question basis does not exist such that T is diagonalizable.

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