

Assignment-15

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Abstract—This assignment deals with matrix linear transformation. Therefore matrix of relative to the pair β, β'

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<https://github.com/satyam463/Assignment-13/blob/main/Assignment%2013.tex>

$$T(\beta) = \begin{pmatrix} 2 & 0 \\ -i & 0 \end{pmatrix} \beta' \quad (2.0.7)$$

1 PROBLEM STATEMENT

Let T be the linear operator on C^2 defined by

$$T(x_1, x_2) = (x_1, 0) \quad (1.0.1)$$

Let β be the standard ordered basis for C^2 and

$$\beta' = \{\alpha_1, \alpha_2\} \quad (1.0.2)$$

be the ordered basis defined by

$$\alpha_1 = (1, i), \alpha_2 = (-i, 2) \quad (1.0.3)$$

What is the matrix of T relative to the pair β, β' ?

2 SOLUTION

Transformation T from C^2 to C^2 . Let

$$\beta = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad (2.0.1)$$

$$\beta' = \begin{pmatrix} 1 & -i \\ i & 2 \end{pmatrix} \quad (2.0.2)$$

T is defined by

$$T(\mathbf{x}) = \mathbf{Ax} \quad (2.0.3)$$

$$T(\mathbf{x}) = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \mathbf{x} \quad (2.0.4)$$

To find relative matrix we will use row reduce augmented matrix.

$$\begin{pmatrix} 1 & -i & 1 & 0 \\ i & 2 & 0 & 0 \end{pmatrix} \quad (2.0.5)$$

$$\begin{pmatrix} 1 & -i & 1 & 0 \\ i & 2 & 0 & 0 \end{pmatrix} \xleftrightarrow[R_1 \rightarrow R_1 + iR_2]{R_2 \rightarrow R_2 - iR_1} \begin{pmatrix} 1 & 0 & 2 & 0 \\ 0 & 1 & -i & 0 \end{pmatrix} \quad (2.0.6)$$