Matrix Theory Assignment 8

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***Abstract*—This problem demonstrate a method to find weather given transformation is linear or not.**

All the codes for the figure in this document can be found at

https://github.com/Ritesh622/Assignment_EE5609/tree/master/Assignment_8

1 Problem

Find weather given functions $\mathbf{T}$ from $\mathbb{R}^2$ into $\mathbb{R}^2$ are linear transformations or not

$$\mathbf{T}(x_1, x_2) = ({x_1}^2, x_2) \tag{1.0.1}$$

2 solution

(2.0.1)

If $\mathbf{T}$ were a linear transformation then we would have

$$\mathbf{T}\begin{pmatrix}1\\0\end{pmatrix} = \begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.2}$$

$$\implies \mathbf{T}\left(-1\begin{pmatrix}1\\0\end{pmatrix}\right) = -1.\mathbf{T}\begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.3}$$

$$\implies -1.\begin{pmatrix}1\\0\end{pmatrix} = \begin{pmatrix}-1\\0\end{pmatrix} \tag{2.0.4}$$

which is a contradiction, since

$$\mathbf{T}\begin{pmatrix}-1\\0\end{pmatrix} = \begin{pmatrix}1\\0\end{pmatrix} \tag{2.0.5}$$

$$\begin{pmatrix}1\\0\end{pmatrix} \neq \begin{pmatrix}-1\\0\end{pmatrix}. \tag{2.0.6}$$

Hence non-linear transformation.