
Exercise 1 Suppose $T : \mathbb{M}_{2,2} \rightarrow \mathbb{R}$ is a linear transformation such that

$$T\left(\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}\right) = 3$$

$$T\left(\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}\right) = -1$$

$$T\left(\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}\right) = 0$$

$$T\left(\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}\right) = 0$$

Find $T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right)$

$$T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = \dots\dots$$

Source

[Nicholson] W. Keith Nicholson, *Linear Algebra with Applications*, Lyryx 2021, Open Edition, Exercises 7.1.4 (d).