Homework 2 - Maths Foundation for Machine Learning

kipngeno koech - bkoech

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1. Let $\{\mathbf{v}_1, \mathbf{v}_2\}$ be a basis of the vector space $\mathbb{R}^2$, where

$$\mathbf{v}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad \text{and} \quad \mathbf{v}_2 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

The action of a linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^3$ on the basis $\{\mathbf{v}_1, \mathbf{v}_2\}$ is given by

$$T(\mathbf{v}_1) = \begin{pmatrix} 2 \\ 4 \\ 6 \end{pmatrix} \quad \text{and} \quad T(\mathbf{v}_2) = \begin{pmatrix} 0 \\ 8 \\ 10 \end{pmatrix}.$$

Find the formula for $T(\mathbf{x})$, where $\mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2$..+