

1 Question 1

Given

$$1. \mathbf{A} = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix}$$

$$2. T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$$

$$3. T(\mathbf{x}) = \mathbf{A}\mathbf{x}$$

Find

$$1. \text{ The image of } u \text{ under } T \text{ where } \mathbf{u} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$$

$$2. \text{ The image of } v \text{ under } T \text{ where } \mathbf{v} = \begin{bmatrix} 0 \\ 1.5 \end{bmatrix}$$

$$3. \text{ The image of } \mathbf{u} + \mathbf{v}$$

1.1 Work

$$1. T(\mathbf{u}) = \mathbf{A}\mathbf{u} = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 3 \\ -1 \end{bmatrix} = \begin{bmatrix} 9 \\ 2 \end{bmatrix}$$

$$2. T(\mathbf{v}) = \mathbf{A}\mathbf{v} = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 0 \\ 1.5 \end{bmatrix} = \begin{bmatrix} 0 \\ -3 \end{bmatrix}$$

$$3. T(\mathbf{u} + \mathbf{v}) = \mathbf{A}(\mathbf{u} + \mathbf{v}) = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 3 \\ 0.5 \end{bmatrix} = \begin{bmatrix} 9 \\ -1 \end{bmatrix}$$

1.2 Illustration

