Practice 2

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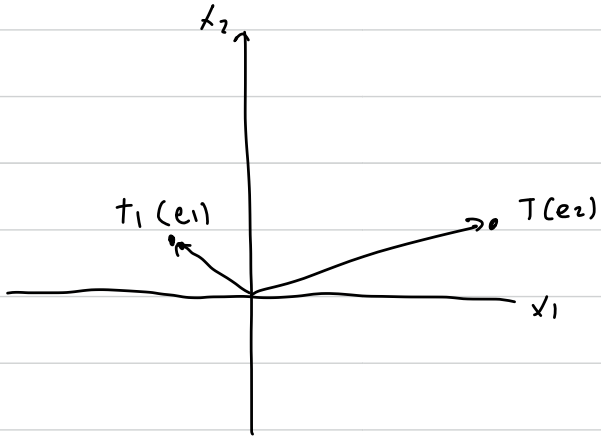
21/481767/TK/53170

1 $T : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$

$T(e_1)$ and $T(e_2)$

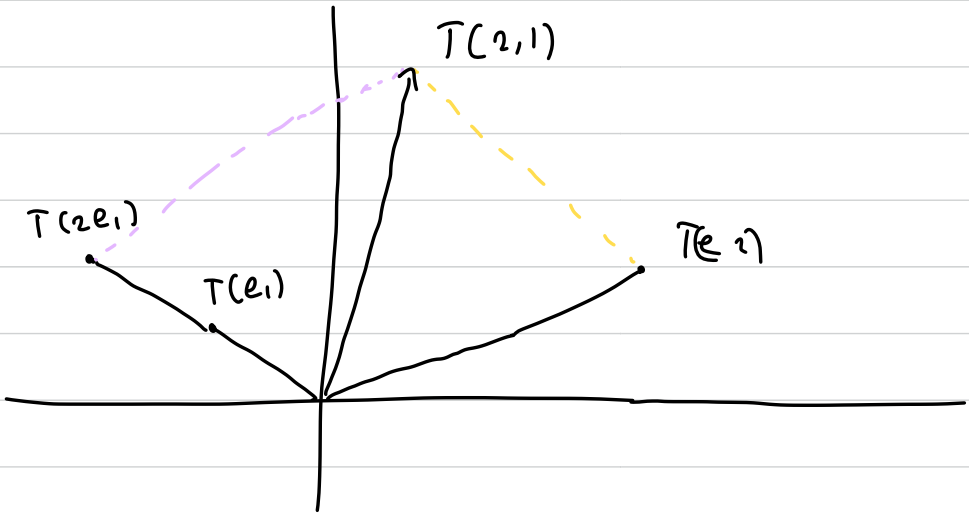
sketch $T(2,1)$



Sketch of $T(2,1)$

because $T(2) = T\left(2\begin{bmatrix}1\\0\end{bmatrix}\right)$

$= T(2e_1)$



2. Let $T : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$

$$T\begin{bmatrix}x_1\\x_2\end{bmatrix} = \begin{bmatrix}x_1 - 2x_2\\-x_1 + 3x_2\\3x_1 - 2x_2\end{bmatrix}$$

Find $\mathbf{x}$ that $T(\mathbf{x}) = \begin{bmatrix}-1\\4\\9\end{bmatrix}$

We know that $T\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = Ax$ wher $T(x)$ is colour combination of A.

Find A:

$$T(x) = \begin{bmatrix} x_1 - 2x_2 \\ -x_1 + 3x_2 \\ 3x_1 - 2x_2 \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & -2 \\ -1 & 3 \\ 3 & -2 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_{x} = \underbrace{\begin{bmatrix} -1 \\ 4 \\ 9 \end{bmatrix}}_{b}$$ with b = image

$$A = \left[\begin{array}{cc|c} 1 & -2 & -1 \\ -1 & 3 & 4 \\ 3 & -2 & 9 \end{array}\right]$$

$R_2 = R_2 + R_1$

$$\left[\begin{array}{cc|c} 1 & -2 & -1 \\ 0 & 1 & 3 \\ 3 & -2 & 9 \end{array}\right]$$

$R_3 = R_3 - 3R_1$

$$\left[\begin{array}{cc|c} 1 & -2 & -1 \\ 0 & 1 & 3 \\ 0 & 4 & 12 \end{array}\right]$$

$R_3 = R_3 - 4R_2$

$$\left[\begin{array}{cc|c} 1 & -2 & -1 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{array}\right]$$

i) $x_2 = 3$

ii) $x_1 - 6 = -1$

$x_1 = 5$

The value of $X = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$ //