HW16 – linear Algebra

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Q/ let $T: \mathbb{R}^4 \to \mathbb{R}^3$ , $v_i \in \mathbb{R}^4$, $w_i \in \mathbb{R}^3$

$T(1,2,3,4) = (5,6,7)$ , goal: $T(51,0,1,-1) = ?$

$T(11,10,9,8) = (2,3,1)$

$T(1,5,7,2) = (7,8,6)$

$T(0,0,0,1) = (9,1,1)$

A/ let's define $\mathcal{U}: \mathbb{R}^4 \to \mathbb{R}^4 : \{(1,0,0,0),(0,1,0,0)\dots\}$

$$\mathcal{U}(1,0,0,0) = \frac{25}{24}v_1 + \frac{1}{24}v_2 - \frac{1}{2} - \frac{7}{2}$$

$$\mathcal{U}(0,1,0,0) = -\frac{17}{6}v_1 + \frac{1}{6}v_2 + v_3 + 8v_4$$

$$\mathcal{U}(0,0,1,0) = \frac{15}{8}v_1 - \frac{1}{8}v_2 - \frac{1}{2}v_3 - \frac{11}{2}v_4$$

$$\mathcal{U}(0,0,0,1) = 0v_1 + 0v_2 + 0v_3 + 1v_4$$

so, $$M(\mathcal{U}) = \begin{pmatrix} 25/24 & -17/6 & 15/8 & 0 \\ 1/24 & 1/6 & -1/8 & 0 \\ -1/2 & 1 & -1/2 & 0 \\ -7/2 & 8 & -11/2 & 1 \end{pmatrix}$$

now we can map $\mathbb{R}^4 : \{(1,0,0,0),\dots\} \to \mathbb{R}^3 : \{(5,6,7),(2,3,1),(7,8,6),(9,1,$

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

lets try this:

$$M(\mathcal{U}) \cdot M(T) \cdot \begin{bmatrix} 51 \\ 0 \\ 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 55 \\ 2 \\ -26 \\ -185 \end{bmatrix} \Rightarrow 55(5,6,7) + 2(2,3,1) + (-26)(7,8,6) + (-185)(9,1,1)$$

But we want achieve results directly.

So lets define $S: \mathbb{R}^3 \to \mathbb{R}^3 : \{(1,0,0), (0,1,0), \dots\}$.

$S(5,6,7) = (1,0,0)$

$S(2,3,1) = (0,1,0)$

$S(7,8,6) = (0,0,1)$

$S(9,1,1) = (0,0,0)$ $\rightsquigarrow$ this is not specified, so I'll just map to 0, so I dont change the basis.

$$M(S) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

now if we do

$$M(S) \cdot \begin{bmatrix} 55 \\ 2 \\ -26 \\ -185 \end{bmatrix} = \begin{bmatrix} 55 \\ 2 \\ -26 \end{bmatrix}$$

however the results of $55(5,6,7) + 2(2,3,1) + \dots$

$$= \begin{bmatrix} -1568 \\ -57 \\ -32 \end{bmatrix}$$

So, what's wrong?

is it maybe not well defiendad?