Linear Transformations I

Section 1.4

M293F FA95 #4

12) (a) $T(0) = \begin{pmatrix} 0+h \\ 0+k \end{pmatrix}$ is not 0 ; (assuming h + k are not)

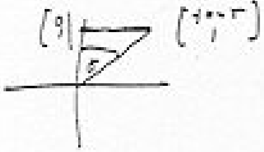
or you could say that $T\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + T\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} x_1+h+y_1+h \\ x_2+k+y_2+k \end{pmatrix} \neq T\begin{pmatrix} x_1+y_1 \\ x_2+y_2 \end{pmatrix}$

& that $T\begin{pmatrix} cx_1 \\ cx_2 \end{pmatrix} = \begin{pmatrix} cx_1+h \\ cx_2+k \end{pmatrix} \neq cT\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} cx_1+ch \\ cx_2+ck \end{pmatrix}$

(b) Matrix for T is $\begin{bmatrix} 1 & 0 & h \\ 0 & 1 & k \\ 0 & 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & \tan r \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{pmatrix} \tan r \\ 1 \end{pmatrix}$

ie



Rotation angle is r.

(d) From the definition of T

$T\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1+h \\ x_2+k \end{bmatrix}$

$S\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1+x_2\tan r \\ x_2 \end{bmatrix}$

$TS\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1+x_2\tan r+h \\ x_2+k \end{bmatrix}$

$ST\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1+h+x_2\tan r+k\tan r \\ x_2+k \end{bmatrix}$

Do not commute.

Commute if $k=0$.

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16) $\underset{3}{}\underset{5}{\begin{bmatrix} x & x & x & x & x \\ x & x & x & x & x \\ x & x & x & x & x \end{bmatrix}}\underset{\mathbb{R}^5}{\begin{bmatrix} x \\ x \\ x \\ x \\ x \end{bmatrix}} = \underset{\mathbb{R}^3}{\begin{bmatrix} x \\ x \\ x \end{bmatrix}}$

(A)

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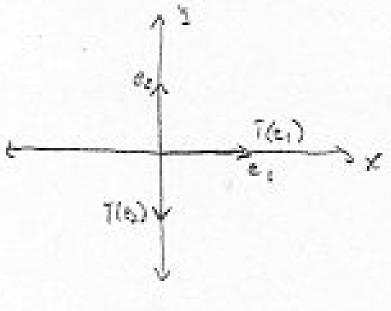
17)



(B) REFLECTION THROUGH THE X-AXIS

Section 14

M293 F SP96 #11

18) The answer is b).

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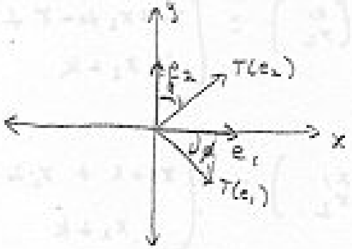
19) The answer is True.

27a) MATH 294 PRELIM 2 SPRING 1998 #4

a)



$T(\underline{x}) = A\underline{x}$

$T(e_1) = \begin{bmatrix} \cos\phi \\ -\sin\phi \end{bmatrix}$ $T(e_2) = \begin{bmatrix} \sin\phi \\ \cos\phi \end{bmatrix}$

$A = \begin{bmatrix} \cos\phi & \sin\phi \\ -\sin\phi & \cos\phi \end{bmatrix}$