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Q2

Let new coordinates are x', y'

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 & 3 \\ -3 & 4 \end{bmatrix} \begin{bmatrix} x' \\ y' \end{bmatrix}$$

$$x = -2x' + 3y'$$

$$y = -3x' + 4y'$$

Substitute in $y = -4x + 3$

$$-3x' + 4y' = -4(-2x' + 3y') + 3$$

$$y' = \frac{11}{16}x' + \frac{3}{16}$$

Q9

a)

standard matrix is

$$[T_1] = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

Compression by factor $1/3$

$$[T_2] = \begin{bmatrix} 1/3 & 0 \\ 0 & 1 \end{bmatrix}$$

$$[T_1 \cdot T_2] = [T_1][T_2] = \begin{bmatrix} 1/3 & 0 \\ 0 & -1 \end{bmatrix}$$

$$[T_2 \cdot T_1] = [T_2][T_1] = \begin{bmatrix} 1/3 & 0 \\ 0 & -1 \end{bmatrix}$$

So, these operations commute.

$$b) [T_1] = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} [T_2] = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$$

$$[T_1 \cdot T_2] = \begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix}$$

$$[T_2 \cdot T_1] = \begin{bmatrix} 0 & 2 \\ 1 & 0 \end{bmatrix}$$

So, these operations

do not commute.

10)

a)

$$[T_1] = \begin{bmatrix} 1 & 0 \\ 1/4 & 1 \end{bmatrix}$$

$$[T_2] = \begin{bmatrix} 1 & 0 \\ 3/5 & 1 \end{bmatrix}$$

$$[T_1 \cdot T_2] = \begin{bmatrix} 1 & 0 \\ 17/20 & 1 \end{bmatrix}$$

$$[T_2][T_1] = \begin{bmatrix} 1 & 0 \\ 17/20 & 1 \end{bmatrix}$$

So, these operations commutes.

b)

$$[T_1] = \begin{bmatrix} 1 & 0 \\ 1/4 & 1 \end{bmatrix}, [T_2] = \begin{bmatrix} 1 & 3/5 \\ 0 & 1 \end{bmatrix}$$

$$[T_1][T_2] = \begin{bmatrix} 23/20 & 3/5 \\ 1/4 & 1 \end{bmatrix}$$

$$[T_2][T_1] = \begin{bmatrix} 1 & 3/5 \\ 1/4 & 23/20 \end{bmatrix}$$

So, these operations do not commute.