Section 4.3 : Same as in section 4.1
Theorem 4.15, Theorem 4.16, Theorem 4.17

Section 4.4 : Theorem 4.22, Theorem 4.23 ∇ ∇ , ~~Theorem 4.24~~, Theorem 4.
~~Lemma 4.26~~, ~~Theorem 4.27~~

~~Section 6.1~~ : ~~Theorem 6.1~~, ~~Theorem 6.2~~, Theorem 6.3

~~Section 6.2~~ : ~~Theorem 6.4~~, ~~Theorem 6.5~~, Theorem 6.8, ~~Theorem 6.9~~.
~~Theorem 6.10~~, ~~Theorem 6.11~~

Review problems

(1) Determine whether the following transformations of $\mathbb{R}^2 \to \mathbb{R}^2$ are linear.

a) $T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1+x \\ y \end{bmatrix}$ b) $T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} y \\ x \end{bmatrix}$ c) $T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x-y \\ 0 \end{bmatrix}$ d) $T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} |x| \\ 0 \end{bmatrix}$

If it is give a proof, if not give a counterexample.

(2) Find the standard matrix representation of the linear transformation from $\mathbb{R}^2$ into $\mathbb{R}^2$ which corresponds to
a) reflection in the line $x=0$
b) rotation counterclockwise around the origin by $45°$.

(3) The standard matrix representation of the linear transformation T from $\mathbb{R}^2$ into $\mathbb{R}^2$ is $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$. What is the geometric interpretation of T?

(4) Find the standard matrix representation of the linear transformation from $\mathbb{R}^2$ into $\mathbb{R}^2$ which corresponds to reflection in the line $y=x$ followed by counterclockwise rotation around the origin by $60°$.

(5) True or false:
a) The composition of two linear transformations is a linear transformation.
b) A linear transformation from $\mathbb{R}^2$ to $\mathbb{R}^2$ always maps a straight line to a parallel straight line.
c) A linear transformation from $\mathbb{R}^2$ to $\mathbb{R}^2$ always maps parallel lines to parallel lines.

(6) Find the image of the vector $v = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ under the linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ consisting of a reflection in the y-axis, followed by a