Linear Algebra
Assignment# 2
Note: Last date for the submission of this assignment is 06-11-2017

Question # 1
Let $T: R^2 \to R^2$ be a transformation defined by

$$T(x_1, x_2) = (x_1 + 1, x_2 + 2)$$

a. Find image of $\begin{bmatrix} 1 \\ 3 \end{bmatrix}$

b. Find a vector whose image is $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$

c. Is $\begin{bmatrix} 5 \\ 5 \end{bmatrix} \in$ Range

d. Prove T is not linear.

Question # 2
Determine either the following transformation is linear or not
$T: M_{22} \to R$ defined by $T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = a + d$

Question # 3
Let $T: R^2 \to R^2$ be a transformation defined by

$$T(x_1, x_2) = (x_1 - 2x_2, -x_1 + 3x_2, 3x_1 - 2x_2)$$

Find x such that $T(x) = (-1, 4, 1)$

Question # 4
Let $T: R^2 \to R^2$ be a transformation that first performs horizontal shear that maps e_2 into $e_2 - 0.5e_1$ but leaves e_1 unchanged then reflect the result through the $x_2 - axis$. Assumin that T is linear. Find its standard matrix A.

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Question #5

Let $T: R^2 \to R^2$ be a transformation that first rotates points through $\frac{-3\pi}{4}$ radians clockwise and then reflect points through the horizontal $x_1 - axis$. Find the standard matrix A.

Question # 6

Let $X = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, $v_1 = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$, and $v = \begin{bmatrix} 7 \\ -3 \end{bmatrix}$ and let $T: R^2 \to R^2$ be a linear transformation that maps X into $x_1 v_1 + x_2 v_2$. Find the matrix such that $T(X) = AX$ for each X.

Question # 7

Find the standard matrices that give us horizontal shear and vertical shear.

Question # 8

Find the standard A that rotates each vector in R^2 through an angle φ in clockwise direction.
