Q1: Consider augmented matrices:

$$A = \left(\begin{array}{cccc|c} 1 & 1 & 2 & 3 & 1 \\ 0 & 0 & 1 & 2 & 1 \\ 0 & 0 & 2 & 4 & 2 \end{array}\right) \qquad B = \left(\begin{array}{cccc|c} 1 & 1 & 2 & 3 & 1 \\ 0 & 0 & 1 & 2 & 1 \\ 2 & 2 & 4 & 6 & 5 \end{array}\right)$$

Mark each statement True or False regarding each matrix.

C) System with this matrix has no solution

D) $\begin{pmatrix} -2 \\ 0 \\ 1 \\ 0 \end{pmatrix}$ is a solution for the system with this matrix

E) $\begin{pmatrix} 0 \\ 0 \\ -1 \\ 1 \end{pmatrix}$ is a solution for the system with this matrix

F) System with this matrix has infinitely many solutions

G) Matrix has pivot position in every row

H) Columns of coefficient matrix span $\mathbb{R}^3$.

I) Rows of coefficient matrix span $\mathbb{R}^2$.

J) $\begin{pmatrix} 1 & 1 & 2 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ has only trivial solution

K) Columns of a matrix are linear independant

L) Rows of a matrix are linear dependant

(For both K & L we consider coefficient mat.

	C	D	E	F	G	H	I	K	L
A	F	F	T	T	F	F	F	F	T
B	T	F	F	F	F	F	F	F	T

J F

Q2: Consider coefficient matrices:

$$A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 2 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{pmatrix}$$

Mark each statement True or False regarding each matrix

C) Equation $Ax = b$ ($Bx = b$ respectively) has solution for every b.

D) Matrix has row echelon form, but not reduced REF.

E) Matrix has reduced REF.

F) Matrix has pivot position in every row.

G) Columns of a matrix span $\mathbb{R}^3$.

H) Solutions of $Ax = 0$ ($Bx = 0$, resp.) form a line.

I) $Ax = 0$ ($Bx = 0$, resp.) has only trivial solution

J) Rows of a matrix are linear dependant.

2)

	C	D	E	F	G	H	I	J
A	T	F	T	T	T	F	T	F
B	F	T	F	F	F	T	F	T

T F

F T

Q3. Mark each statement True or False or Choose 1 correct answer.

A) T is reflection with respect to $y = -x$. Which of following matrices is matrix of T?

1) $\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$ 3) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ 4) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

B) T is rotation by $\pi/4$. Which of following matrices is matrix of T?

1) $\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 3 & 3 \\ 3 & 3 \end{pmatrix}$ 4) $\begin{pmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ -1/\sqrt{2} & 1/\sqrt{2} \end{pmatrix}$

C) Which vector will be transformed into $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ under linear transformation with matrix: $\begin{pmatrix} 1/2 & 1/2 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$?

1) $\begin{pmatrix} 4 \\ 4 \end{pmatrix}$ 3) $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$

2) $\begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ 4) $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

D) $T\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x^2+y^2+z^2 \\ x \\ y \end{pmatrix}$ is linear transformatio

E) Linear transformation with matrix $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ transform $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ into $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

F) Linear transformation T transform $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ into $\begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$; $\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ into $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ into $\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$.

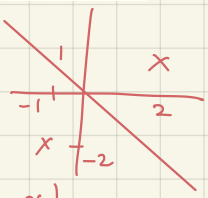
3)

A	B	C	D	E	F
3	4	3	F	T	3

A) T is reflection with respect to $y = -x$. Which of following matrices is matrix of T?

1) $\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$ 3) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ 4) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

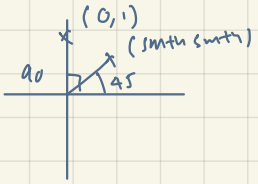
$$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{matrix} -y \\ -x \end{matrix}$$



from (x, y) to $(-y, -x)$

B) T is rotation by $\pi/4$ ($45°$). Which of following matrices is matrix of T?

1) $\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 3 & 3 \\ 3 & 3 \end{pmatrix}$ 4) $\begin{pmatrix} 1/2 & 1/2 \\ -1/2 & 1/2 \end{pmatrix}$



$$\begin{pmatrix} 1/2 & 1/2 \\ -1/2 & 1/2 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{pmatrix}$$

C) Which vector will be transformed into $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ under linear transformation with matrix: $\begin{pmatrix} 1/2 & 1/2 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$?

1) $\begin{pmatrix} 4 \\ 4 \end{pmatrix}$ 2) $\begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ 3) $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ 4) $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

D) $T\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x^2+y^2+z^2 \\ x \\ y \end{pmatrix}$ is linear transformatic

NO

Which matrix will be the matrix of this linear transformation? (4)

1) $\begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 1 & 2 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{pmatrix}$ 3) $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 0 \\ 2 & 0 & 1 \end{pmatrix}$ 4) $\begin{pmatrix} -1 & -1 & 2 \\ -1 & 0 & 0 \\ -1 & 0 & -1 \end{pmatrix}$

Answers:

Q1:

	C	D	E	F	G	H	I	K	L
A	F	T	T	T	F	F	F	F	T
B	T	F	F	F	F	F	F	F	T

J: False

Q2:

	C	D	E	F	G	H	I	J
A	T	T	F	T	T	F	T	F
B	F	F	T	F	F	T	F	T

Q3:

A	B	C	D	E	F
3)	4)	3)	F	T	3)