1. Some transformations are mentioned below. (i). Find domain & codomain in each case ; (ii). Find [T] , if it exists ; (iii). Conclude: if T is a linear transformation or not:

a. $T(x,y,z) = (x - 2y, -2z, z + x)$; b. $T(x,y,z) = (-x - 2y, 6z + 5x)$.
c. $T(x,y,z) = (9x - 2y, -z, 4z + x, -5x-y-3z)$.
d. $T(x,y,z) = (9x - 2y, -xyz, z + x)$. e. $T(x,y,z) = (23x - 2y + 5z, 0)$.
f. $T(x,y) = (0, -y, y + x)$. g. $T(x,y,z) = (8x , -z, 4z + 5x, 5)$.
h. $T(x,y,z) = (-7z + 9x-y)$. i. $T(x,y,z) = (2x + 8y, 5y, -2z)$.
j. $T(x,y,z) = (2x + y, 4x-y, 3z)$.

k. $T(x,y,z) = (a_1x + b_1y + c_1z, a_2x + b_2y + c_2z, a_3x + b_3y + c_3z)$.

l. $T(a,b,c) = (a-b,0,a-c,b,0)$. m. $T(a,b,c,d) = (a-b+c-2d, 0, d-c, -b, a+b)$.

n. $T(a,b,c,d) = (3a-b+c-5d, 0, a-c-d, b)$. o. $T(p,q,r,s,t) = (5p-q+r,-t, rs)$.
p. $T(p,q,r) = (8p, 2p + 3q,-q-2r)$

q. $T(p,q,r,s,t) = (s-t,0,5)$. r. $T(p,q,r) = (p-q, 0, -r, q)$

2. Some transformation matrices are mentioned below:

(a). $\begin{pmatrix} -1 & 2 & 0 \\ 3 & 0 & 1 \\ 0 & -4 & -5 \end{pmatrix}$ (b). $\begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$ (c). $\begin{pmatrix} 1 & 3 \\ -1 & -3 \end{pmatrix}$ (d). $\begin{pmatrix} 2 & -1 & 1 & 3 \\ 1 & -2 & -1 & 0 \\ 3 & -3 & 0 & 3 \end{pmatrix}$.

Fins the corresponding LTs.

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3 Define the inverse operator. Verify your result .

(a). $T(x,y,z) = (-7x + 3y + z, 2x - 5z, 4x + 5y, -x + 2y + 3z)$.

(b). $T(x,y,z) = (-7x + 3y + z, 2x - 5z, 4x + 5y, 0)$. (c). $T(x,y,z) = (-7x + 3y + z, 2x - 5z, 4x + 5y)$.
(d). $T(x,y,z) = (x - z + y , 2x - 5y + 4z)$.
(e). $T(x,y,z,t) = (-7x + 3y + z, 2x - 5t, 4x + 5y + z + t)$. (f). $T(x,y,z) = (2x + y, x-y, z)$.
(g). $T(x,y) = (3x-2y, y-4x)$.

(h). $T(x,y) = (x-2y, 10y - 5x)$. (i). $T(x,y) = (3x-2y, y-4x, x + y)$.

(k). $T(x,y,z) = (2x + y, x-y, z-x, x+y)$.

4.

We consider 2 linear transformations S and T as given below. Find $S \circ T$ and $T \circ S$.

1. $T(a,b,c,d) = (2b-a + 2d, c + a-d, a + b + c + d)$; $S(x,y,z) = (-3y + z , x + y + 5z)$.

2. $T(x,y) =(-2x+y, y-z, z+4x)$, $S(a,b,c) = (-b,-c,-a, a+b+c)$.