

$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

a) Find the standard matrix of T.

b) Find all vectors
$$\mathbf{u}$$
 satisfying $T(\mathbf{u}) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

$$A = \begin{bmatrix} 1 & -2 \\ 1 & 1 \\ 1 & -3 \end{bmatrix}$$

$$T(e_i) = \begin{cases} 6 \\ T(e_i) = \begin{cases} 6 \\ 7 \end{cases}$$

$$T(e_i) = T \begin{cases} 6 \\ 7 \end{cases} = \begin{bmatrix} 6 \\ 7 \end{cases}$$

$$T(e_i) = T \begin{cases} 7 \\ 7 \end{cases} = \begin{bmatrix} 7 \\ 7 \end{cases}$$

$$T(e_i) = T \begin{cases} 7 \\ 7 \end{cases} = \begin{bmatrix} 7 \\ 7 \end{cases}$$

$$T(v) = \begin{bmatrix} 1 & 2 \\ 1 & -2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -2 \\ 1 & -3 \end{bmatrix} C = \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 2 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 4 & 0 & 0 \end{bmatrix}$$

b)
$$T(u) = C_1 \times 1 + C_2 \times 2$$
 $U = C_1 c_1 + C_2 c_2$
 $T(u) = T(c_1 c_1) + T(c_2 c_2)$
 $= C_1 T(e_1) + C_2 T(e_2)$
 $= \left[T(e_1) + \left[\frac{c_2}{c_2}\right] - \left[\frac{c_1}{c_2}\right] = A \cdot U$
 $\left[\frac{c_1}{c_2}\right] + \left[\frac{c_2}{c_2}\right] = A \cdot U$



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

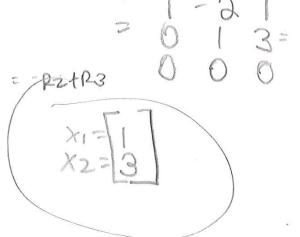
$$\begin{bmatrix} 1 - 2 \\ 1 & 1 \\ 1 & -3 \end{bmatrix}$$
 (u) = $\begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}$

$$T = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$$

$$\begin{bmatrix} x_1 & x_2 \\ 1 & -2 & 1 \\ 1 & 1 & 10 \\ 1 & -3 & -2 \end{bmatrix} = \begin{bmatrix} 2z - P_1 - P_1 - P_1 + P_2 \\ 1 - 3 & -2 \end{bmatrix} = \begin{bmatrix} 1 - 3 & 1 \\ 0 & 3 & 9 \\ 1 - 3 & -2 \end{bmatrix}$$

$$(039)^3$$
 0 1 3 = PztP3 0 0 0 0

$$Q_1 = Q(R_2) + R_1 = 101$$
 $X_1 = [1]$ $X_2 = [3]$





$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.
- a) Standard matrix of T: [-2]
- b) as linear transformation Au = T(u)
 - $\begin{bmatrix} 1 & -2 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} \lambda_1 \\ \lambda_2 \end{bmatrix} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$
- $\begin{array}{cccc}
 \hline
 0 & u_1 2 u_2 = 1 \\
 \hline
 0 & u_1 + u_2 = 10 \\
 \hline
 0 & u_1 3 u_2 = -2
 \end{array}$

- :. U1=1+242 :. U1=1+2(3)=1+6=7 : 1+242+42=10 [:'W,=1+242]: 342=9: . U2=3 : U, - 3 (3) = 2 [: U2 = 3]
 - :. u, 9 = ? :. U, = 7
- $\therefore u = \begin{bmatrix} 7 \\ 3 \end{bmatrix}$



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

$$\begin{cases} 71 = -703 \\ 71 = -398 \\ 71 = 43 \end{cases}$$

$$u \in Span \begin{bmatrix} -7 \\ -3 \end{bmatrix}$$



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

$$\alpha, \quad T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix} \qquad x_1 \begin{bmatrix} 1 \\ 1 \end{bmatrix} + x_2 \begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix}$$

$$e_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix} / e_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & -2 \\ 1 & 1 \\ 1 & -3 \end{bmatrix}$$

$$x_1\begin{bmatrix} 1 \\ 1 \end{bmatrix} + x_2\begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix}$$

$$e_{1} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad e_{2} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & -2 \\ 1 & 1 \end{bmatrix}$$

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$$A$$

$$\begin{vmatrix}
1 & -2 & 1 \\
1 & 1 & 0
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -2 & 1 \\
0 & 3 & 9
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -2 & 1 \\
0 & 3 & 9
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -3 & -2
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -2 & 1 \\
-3 & -2
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -2 & 1 \\
0 & -1 & -3
\end{vmatrix}$$

$$\begin{vmatrix}
1 & -2 & 1 \\
0 & -1 & -3
\end{vmatrix}$$

$$\begin{vmatrix}
0 & 1 & 3 \\
0 & 0 & 0
\end{vmatrix}$$

$$\begin{vmatrix}
0 & 1 & 3 \\
0 & 0 & 0
\end{vmatrix}$$

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0 & 1 & 3 \\
0 & 0 & 0
\end{vmatrix}$$

$$\begin{vmatrix}
0 & 1 & 3 \\
0 & 0 & 0
\end{vmatrix}$$

$$\begin{vmatrix}
0 & 1 & 3 \\
0 & 0 & 0
\end{vmatrix}$$

$$\begin{cases} 1 & 0 & 7 & x_1 = 7 \\ 0 & 1 & 3 & x_2 = 3 \\ 0 & 0 & 0 & 0 \end{cases}$$

$$u = \begin{bmatrix} 7 \\ 3 \end{bmatrix}$$



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix} = x_1 \begin{bmatrix} 1 \\ 1 \end{bmatrix} + x_2 \begin{bmatrix} -\lambda \\ 1 \\ -3 \end{bmatrix} = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$$

a) Find the standard matrix of T.

b) Find all vectors u satisfying
$$T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$$
.

$$T(e_i) = T([i]) = [i]$$

a)
$$A = [T(e_1) T(e_2)]$$

$$A = \begin{bmatrix} 1 & -2 \\ 1 & 1 \end{bmatrix}$$

$$T(e_1) = T(\begin{pmatrix} 0 \\ 1 \end{pmatrix}) = \begin{bmatrix} -2 \\ 1 \\ -3 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 10 & 6 \\ 1 & 1 & 10 \\ 0 & 1 & 3 \end{bmatrix} \Rightarrow \begin{bmatrix} 10 & 6 \\ 0 & 1 & 3 \\ 1 & 1 & 10 \end{bmatrix} \Rightarrow \begin{bmatrix} 10 & 6 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$$

$$u = Span \begin{pmatrix} 6 \\ 3 \\ 0 \end{pmatrix}$$



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of \mathcal{T} .
- b) Find all vectors u satisfying $T(\mathbf{u}) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

a)
$$T(u) = T(\begin{bmatrix} a_1 \\ a_2 \end{bmatrix}) = \begin{bmatrix} a_1 - 2a_2 \\ a_1 + a_2 \\ a_1 - 3a_2 \end{bmatrix}$$

b) $\begin{bmatrix} 1 & -2 & | & 1 \\ | & 1 & | & 10 \\ | & -3 & | & -2 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & -2 & | & 1 \\ | & 1 & | & 10 \\ | & 1 & | & -2 & | & -8 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & -2 & | & 1 \\ | & 1 & | & 10 \\ | & 0 & | & -9 \end{bmatrix}$

No vector satisfies T(u).



$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

$$T.$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$. where $C_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ a)

$$T(e_1) = T([0]) = [1] \cdot [A = [1 - 2] \cdot [A = [1 - 3]]$$
 $T(e_2) = T([1]) = [-2] \cdot [A = [1 - 3]$

5)
$$T(u) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

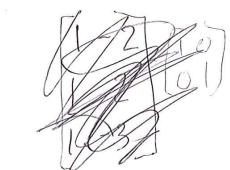
$$U = \begin{bmatrix} 3 \end{bmatrix}$$

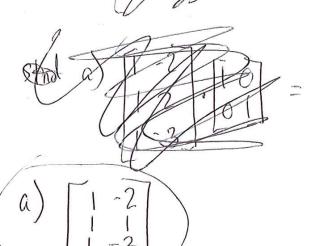


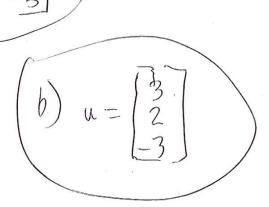
$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

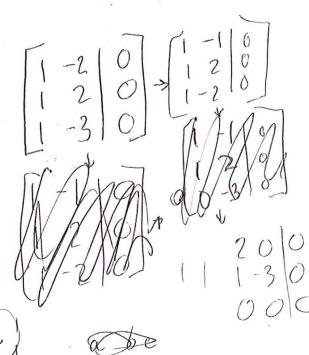
$$3 \times 2 \quad 2 \times 2$$

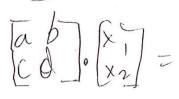
- a) Find the standard matrix of T.
- b) Find all vectors **u** satisfying $T(\mathbf{u}) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.













$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

a) Find the standard matrix of
$$T$$
.

b) Find all vectors \mathbf{u} satisfying $T(\mathbf{u}) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

$$T \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ -2 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \\ 0 \end{bmatrix} = \begin{bmatrix} -2 \\ 0 \end{bmatrix}$$

$$A_1 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

$$A_2 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

$$A_3 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

$$A_4 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

$$A_5 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

$$A_6 \begin{bmatrix} 1 \\ 4 \\ 4 \end{bmatrix}$$

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$$A_2 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$A_1 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

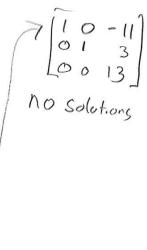
$$A_1 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$A_2 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$A_3 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$A_4 \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$A_5 \begin{bmatrix} 1 \\$$





$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 2x_2 \\ x_1 + x_2 \\ x_1 - 3x_2 \end{bmatrix}$$

- a) Find the standard matrix of T.
- b) Find all vectors u satisfying $T(u) = \begin{bmatrix} 1 \\ 10 \\ -2 \end{bmatrix}$.

a)
$$T = \begin{bmatrix} 1 - 2 \\ 1 & 1 \\ + 1 & -3 \end{bmatrix}$$