Talk with the people around you for a minute

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & -3 & 4 \\ -1 & 3 & 2 \end{bmatrix} \qquad \text{REF}(A) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

The columns of A are linearly independent

(a) True, and I can explain why

(b) True, but I am unsure why

(c) False, and I can explain why

(d) False, but I am unsure why

(e) Hmm, I think I need more information

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The vectors $\vec{\mathbf{v_1}} = \begin{bmatrix} 2 \\ 0 \\ 3 \end{bmatrix}$, $\vec{\mathbf{v_2}} = \begin{bmatrix} 0 \\ -1 \\ 6 \end{bmatrix}$, $\vec{\mathbf{v_3}} = \begin{bmatrix} -2 \\ -4 \\ 21 \end{bmatrix}$ lie in the same plane in $\mathbb{R}^3$

(a) True, and I can explain why

(b) True, but I am unsure why

(c) False, and I can explain why

(d) False, but I am unsure why

(e) Hmm, I think I need more information

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If A is a 4×5 matrix the columns of A are linearly independent

(a) True, and I can explain why

(b) True, but I am unsure why

(c) False, and I can explain why

(d) False, but I am unsure why

(e) Hmm, I think I need more information

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If A is a 5×4 matrix the columns of A are linearly independent

(a) True, and I can explain why

(b) True, but I am unsure why

(c) False, and I can explain why

(d) False, but I am unsure why

(e) Hmm, I think I need more information

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation defined by $T(\vec{\mathbf{x}}) = A\vec{\mathbf{x}}$.

Let $\vec{\mathbf{e_1}} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$, $\vec{\mathbf{e_2}} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, and $\vec{\mathbf{u}} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

For each matrix A,

(a) Find $T(\vec{\mathbf{e_1}})$, $T(\vec{\mathbf{e_2}})$, and $T(\vec{\mathbf{u}})$

(b) Plot these vectors in $\mathbb{R}^2$

(c) Give a geometric description of T.

1. $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ **2**. $A = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$ **3**. $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$