

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

$$\text{Let } \vec{e}_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \vec{e}_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \text{ and } \vec{u} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

For each matrix A ,

- (a) Find $T(\vec{e}_1)$, $T(\vec{e}_2)$, and $T(\vec{u})$
- (b) Plot these vectors in \mathbb{R}^2
- (c) Give a geometric description of T .

$$\mathbf{1.} \ A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

$$\mathbf{2.} \ A = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$$

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