

Let T be the linear transformation defined by $T(\mathbf{x}) = A\mathbf{x}$.

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

For each matrix A ,

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

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

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

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