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

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

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