

Inverses

Apply each of the above matrices to the vectors $(1, 1)$, $(1, 2)$, and $(2, 1)$. Sketch the results. Describe the effect of the matrix. What happens to the area of the matrix? What happens to the angles in the corners?

$$T_1 = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix} \quad (1)$$

$$T_2 = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \quad (2)$$

$$T_3 = \begin{pmatrix} 0.707 & -0.707 \\ 0.707 & 0.707 \end{pmatrix} \quad (3)$$

$$T_4 = \begin{pmatrix} 1 & 0 \\ 1 & -1 \end{pmatrix} \quad (4)$$

Determine the single matrix that performs the following operations:

1. A rotation of $\pi/3$ followed by a rotation of $5\pi/3$
2. A rotation of $\pi/3$ followed by a rotation of $-\pi/3$
3. A rotation of $\pi/3$ followed by a dilation of 3
4. A rotation of $\pi/3$ followed by a dilation of 3 followed by a reflection