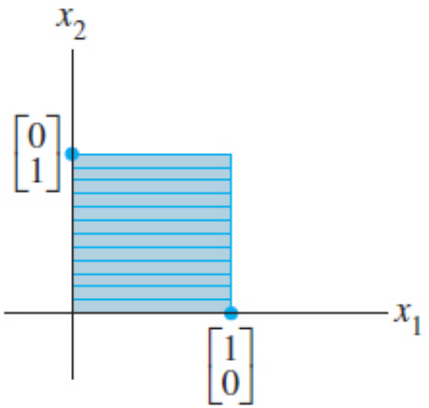
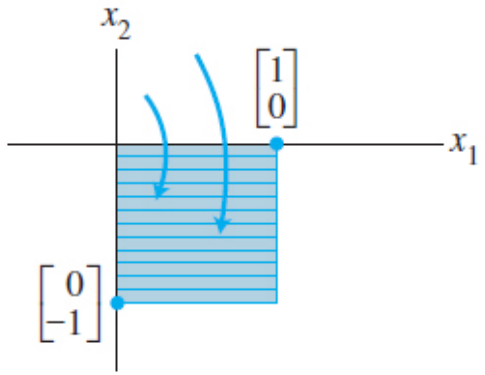
Geometrical transformations

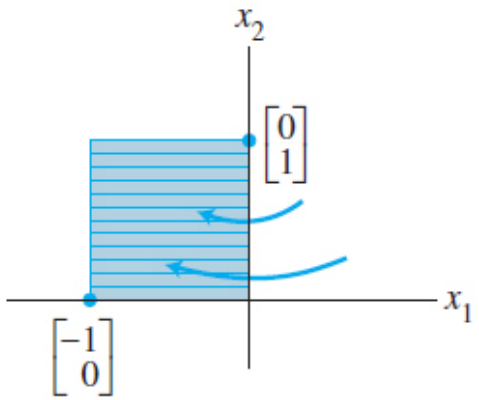
Certain matrix transformations are used to transform the unit square into different shapes. The following table shows some of such transformations.



Transformation	Image of the Unit Square	Standard Matrix
Reflection through the x_1-axis		$\begin{bmatrix}1 & 0\\0 & -1\end{bmatrix}$

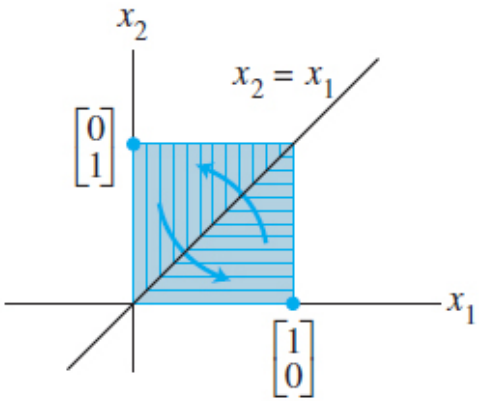
Geometrical transformations

Reflection through the x_2-axis



$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$$

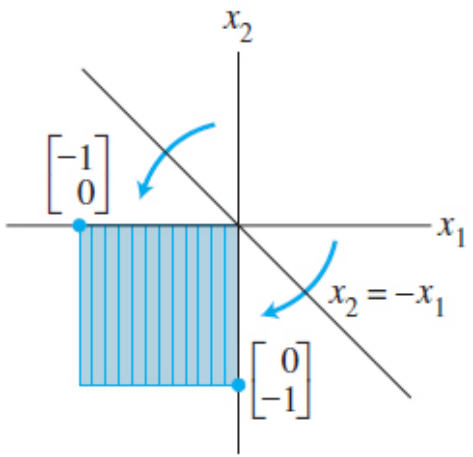
Reflection through the line $x_2 = x_1$



$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

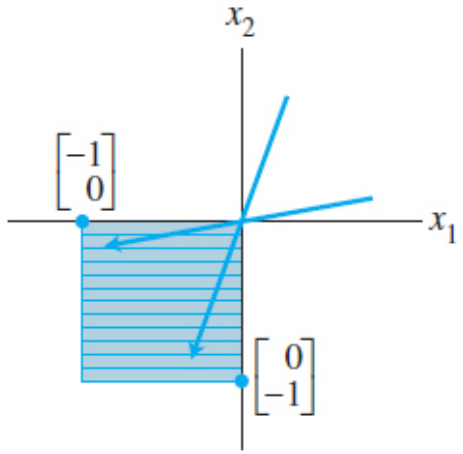
Geometrical transformations

Reflection through the line $x_2 = -x_1$



$$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$$

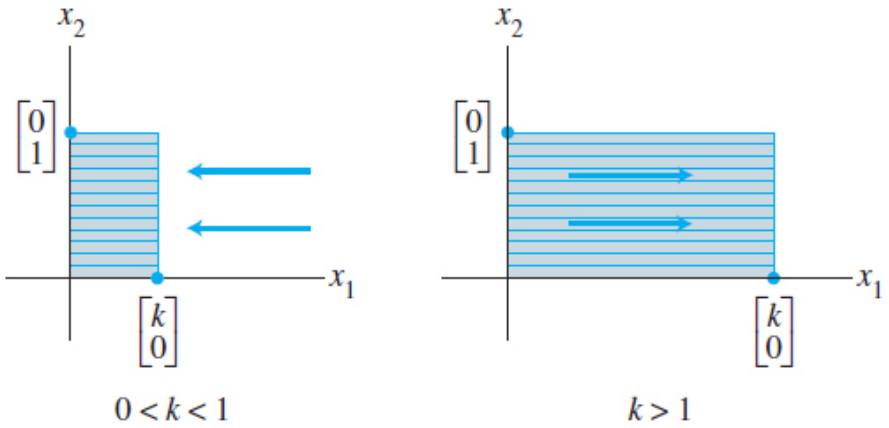
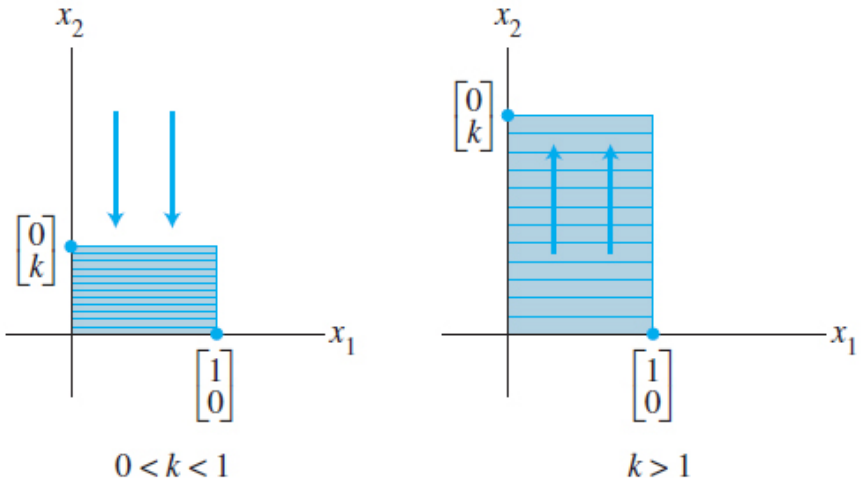
Reflection through the origin



$$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

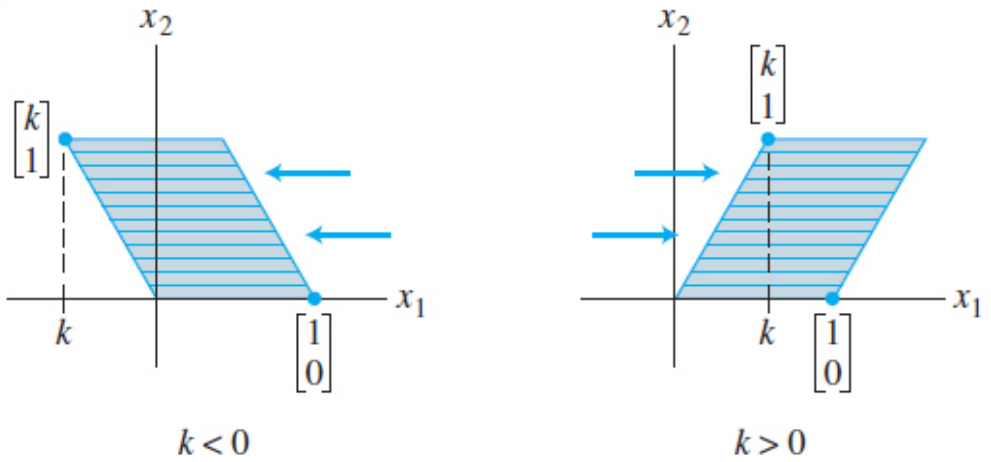
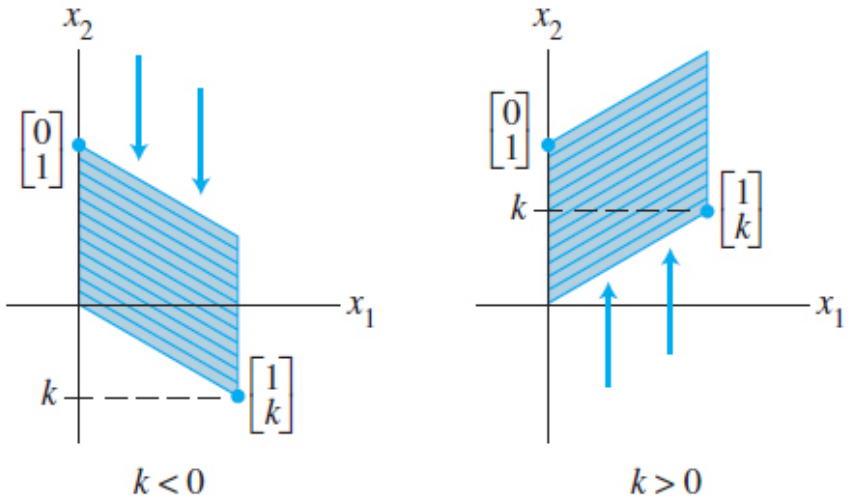
Geometrical transformations

TABLE 2 Contractions and Expansions

Transformation	Image of the Unit Square	Standard Matri
Horizontal contraction and expansion		$\begin{bmatrix}k & 0\\0 & 1\end{bmatrix}$
Vertical contraction and expansion		$\begin{bmatrix}1 & 0\\0 & k\end{bmatrix}$

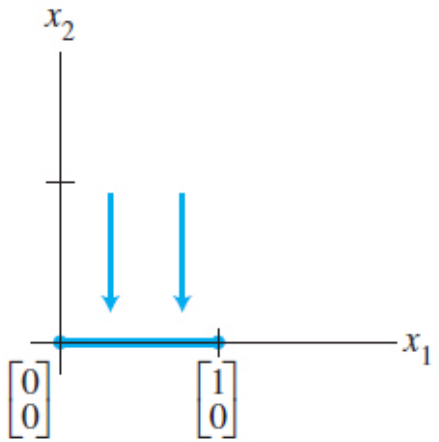
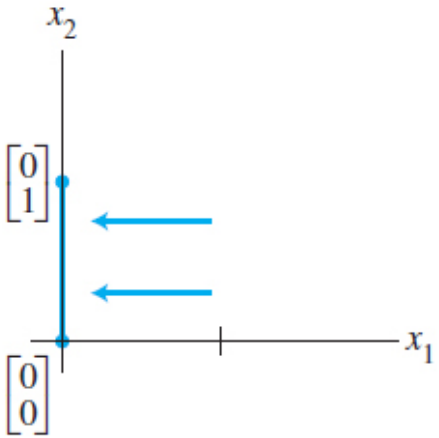
Geometrical transformations

TABLE 3 Shears

Transformation	Image of the Unit Square	Standard Matrix
Horizontal shear		$\begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$
Vertical shear		$\begin{bmatrix} 1 & 0 \\ k & 1 \end{bmatrix}$

Geometrical transformations

TABLE 4 Projections

Transformation	Image of the Unit Square	Standard Matrix
Projection onto the x_1-axis		$\begin{bmatrix}1 & 0\\0 & 0\end{bmatrix}$
Projection onto the x_2-axis		$\begin{bmatrix}0 & 0\\0 & 1\end{bmatrix}$