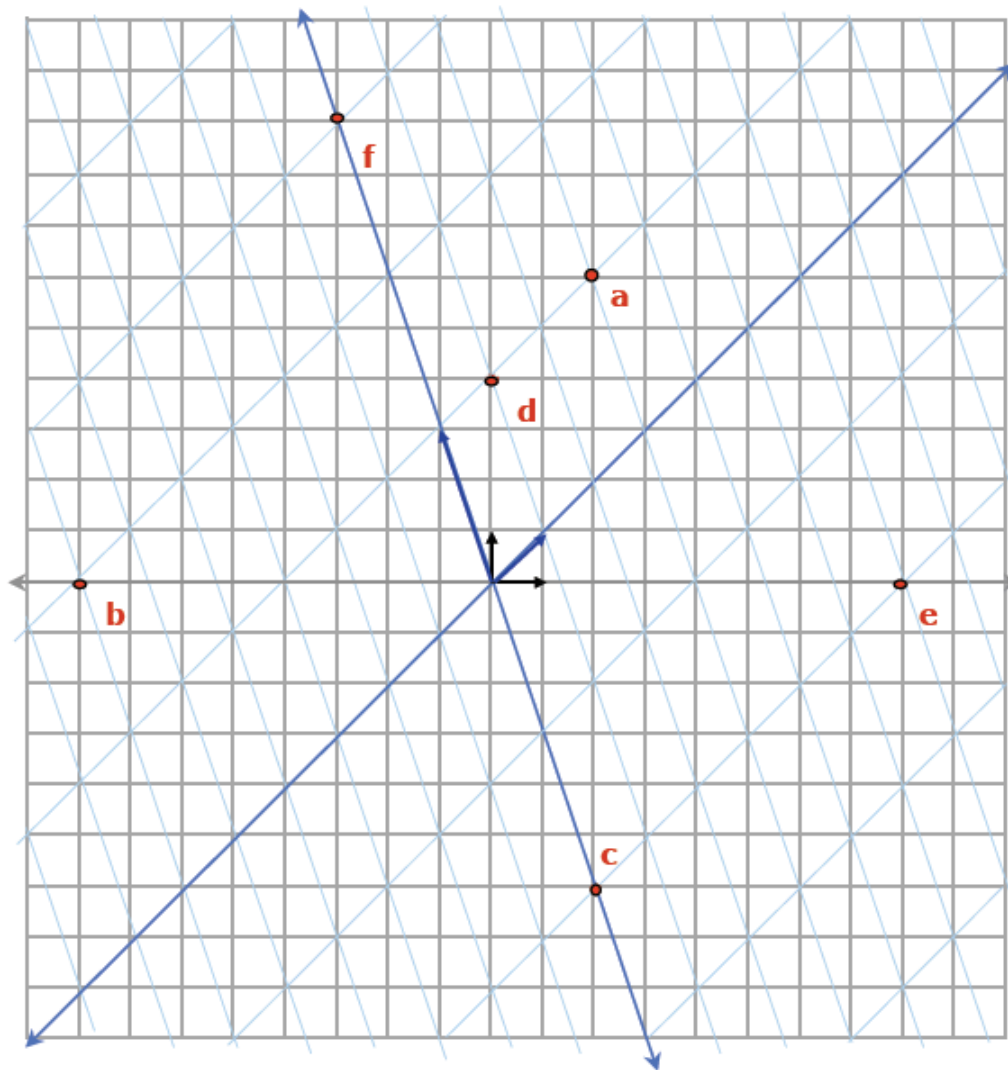


The Blue and Black Task

Consider the following two coordinate systems of \mathbb{R}^2 : the black coordinate system and the blue coordinate system.



1. Write the coordinates of each of the above points relative to both the blue and the black coordinate systems.

2. Determine a matrix that will:
- Rename points from the blue coordinate system as points in the black one.
 - Rename points from the black coordinate system as points in the blue one.

3. Recall the linear transformation from Task 1: vectors along the line $y = -3x$ get stretched by a factor of 2, and vectors along the line $y = x$ remain fixed.

Determine what happens to each of the vectors below under the transformation. Express the result in both the blue and the black coordinate systems. Describe your methods both graphically and with matrix equations.

a. $[\mathbf{x}_1]_{blue} = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$

b. $[\mathbf{x}_2]_{blue} = \begin{bmatrix} 4 \\ -3 \end{bmatrix}$

c. $[\mathbf{x}_3]_{black} = \begin{bmatrix} -8 \\ -7 \end{bmatrix}$