4.9: Matrices as Transformations of the Coordinate Plane

Practice Tasks

I. Concepts and Procedures

1. The reflection matrix for a reflection over the x-axis is _____

2. The rotation matrix for a 90° rotation about the origin is _____

3. Find the coordinates of the vertices of each figure after the given transformation:

   a. Rotation 270° about the origin
   $$\begin{bmatrix} -4 & 1 & -2 \\ -4 & -3 & -5 \end{bmatrix}$$

   b. Translation: 7 units left and 3 unis down
   $$\begin{bmatrix} 2 & 0 & 1 & 4 \\ -3 & 0 & 0 & -2 \end{bmatrix}$$

   c. Dilation of 3.25
   $$\begin{bmatrix} -1 & 2 & -1 \\ 1 & 2 & -1 \end{bmatrix}$$

d. Reflection across y = -x.

$$\begin{bmatrix} 3 & 4.5 & 5 & 3.5 \\ 3 & 1.5 & 2 & 4 \end{bmatrix}$$

e. Rotation 90° about the origin

$$\begin{bmatrix} -1 & -2 & -4 & -6 & -2 \\ -4 & 0 & 0 & -3 & -4 \end{bmatrix}$$

f. Dilation of $\frac{1}{5}$

$$\begin{bmatrix} 0 & 4 & 8 & 6 \\ 0 & 4 & 4 & 2 \end{bmatrix}$$

II. Reasoning

1. Graph $\begin{bmatrix} 9 & 10 & 6 \\ 1 & -3 & -2 \end{bmatrix}$ and $-2\begin{bmatrix} 9 & 10 & 6 \\ 1 & -3 & -2 \end{bmatrix}$. Compare the graphs. Generalize how a negative dilation changes a graph.

2. Write a rule to describe each transformation:

a. $\begin{bmatrix} 1 & 1 & 4 & 5 \\ 2 & 3 & 2 & 1 \end{bmatrix} \xrightarrow{yields} \begin{bmatrix} 0.5 & 0.5 & 2 & 2.5 \\ 1 & 1.5 & 1 & .5 \end{bmatrix}$

b. $\begin{bmatrix} -4 & -3 & -1 \\ -3 & 1 & 0 \end{bmatrix} \xrightarrow{yields} \begin{bmatrix} -1 & 0 & 2 \\ -3 & 1 & 0 \end{bmatrix}$