Lesson 27: Getting a Handle on New Transformations

Classwork

Opening Exercise

Explain the geometric effect of each matrix.

**Example 1**

Given the transformation with :

* 1. Perform this transformation on the vertices of the unit square. Sketch the image and label the vertices.
  2. Calculate the area of the image using the dimensions of the image parallelogram.
  3. Confirm the area of the image using the determinant.
  4. Perform the transformation on .
  5. In order for two matrices to be equivalent, each of the corresponding elements must be equivalent. Given that, if the image of this transformation is , find .
  6. Perform the transformation on . Write the image matrix.
  7. Perform the transformation on the image again, and then repeat until the transformation has been performed four times on the image of the preceding matrix.

Exercise 1

1. Perform the transformation with on the vertices of the unit square.
   1. What are the vertices of the image?
   2. Calculate the area of the image.
   3. If the image of the transformation on is , find in terms of .

**Example 2**

Consider the matrix . For each real number consider the point .

* 1. Find point when .
  2. Find point when .
  3. Show that for is the midpoint of .
  4. Show that for each value of is a point on the line through and .
  5. Find and .
  6. What is the equation of the line through and ?
  7. Show that lies on the line through and .

Problem Set

1. Perform the following transformation on the vertices of the unit square. Sketch the image, label the vertices, and find the area of the image parallelogram.
2. Given . Find if the image of the transformation is the following:
3. Given . Find value of so that:
   1. and the image is
   2. and the image is
4. Given . Find value of so that:
   1. and the image is
   2. and image is
5. Perform the following transformation on the vertices of the unit square. Sketch the image, label the vertices, and find the area of the image parallelogram.
6. Consider the matrix . For each real number , consider the point .
   1. Find the point when .
   2. Find the point when .
   3. Show that foris the midpoint of *.*
   4. Show that for each value of *,*  is a point on the line through and .
   5. Find and *.*
   6. What is the equation of the line throughand *?*
   7. Show thatlies on the line throughand *.*