Lesson 6: Linear Transformations as Matrices

Classwork

Opening Exercise

Let ,, and. Does this represent a linear transformation? Explain how you know.

Exploratory Challenge 1: The Geometry of 3D Matrix Transformations

* 1. What matrix in serves the role of in the real number system? What is that role?
  2. What matrix in serves the role of in the real number system? What is that role?
  3. What is the result of scalar multiplication in ?
  4. Given a complex number , what represents the transformation of that point across the real axis?

Exploratory Challenge 2: Properties of Vector Arithmetic

* 1. Is vector addition commutative? That is, does for each pair of points in ? What about points in ?
  2. Is vector addition associative? That is, does for any three points in ? What about points in ?
  3. Does the distributive property apply to vector arithmetic? That is, does for each pair of points in ? What about points in ?
  4. Is there an identity element for vector addition? That is, can you find a point in such that for every point in ? What about for?
  5. Does each element in have an additive inverse? That is, if you take a point in , can you find a second point such that ?

Problem Set

1. Show that the associative property, *,* holds for the following.
   1. ,,
   2. ,,
2. Show that the distributive property, , holds for the following.
   1. ,,
   2. ,,
3. Compute the following.
4. Let . Compute , plot the points, and describe the geometric effect to .
5. Let . Compute . Describe the geometric effect to .
6. Find the matrix that will transform the point to the following point:
7. Find the matrix/matrices that will transform the point to the following point:

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