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# 1 Linear Transformations

## Learning Outcomes

After completing this chapter, students should be able to do the following.

- Interpret a matrix as a linear transformation from  $\mathbb{R}^n$  to  $\mathbb{R}^m$ .
- Produce a matrix representation of a linear transformation given its action on the standard unit vectors.
- Identify some basic geometric transformations of the plane.
- Discuss the kernel and image of the transformation geometrically and in terms of nullity and rank of the matrix.
- Give examples of linear transformations that are invertible or not invertible.
- Interpret a matrix product as a composition of linear transformations.