In this unit, you will explore the most common partial differential equations that arise in physics contexts. You will learn the separation of variables procedure to solve these equations.

Motivating Questions

- How are *partial* differential equations (PDEs) different from *ordinary* differential equations (ODEs)?
- What new kinds of physics can we learn from solving partial differential equations?
- What can we learn about physics and geometry from the separation of variables procedure?

Key Activities/Problems

- Problem: Laplace's Equation in Polar Coordinates
- Activity: Separation of Variables - Spherical Harmonics

Unit Learning Outcomes

At the end of this unit, you should be able to:

- Identify and classify several common PDEs.
- Identify the number and types of boundary and initial conditions that are appropriate to different PDEs.
- Identify the conditions where the separation of variables is appropriate and useful.
- Solve simple partial differential equations through the separation of variables procedure.