Student handout

In this unit, you will explore the electrostatic potential $V(\vec{r})$ due to one or more discrete charges and the gravitational potential $\Phi(\vec{r})$ due to one or more discrete masses. How does the potential vary in space? How do equipotential surfaces and the superposition principle help you answer these questions graphically? How does the value of the potential fall-off as you move away from the charges? How do power series approximations help you answer these questions algebraically?

Key Activities/Problems

- Drawing Equipotential Surfaces
- Electrostatic Potential Due to a Pair of Charges (with Series)
- Linear Quadrupole

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

- Describe the important similarities and differences between the electrostatic potential and the gravitational potential.
- Sketch the potential due to a small number of discrete charges or masses, showing important regions of interest and qualitatively depict the correct spacing between equipotential surfaces (or curves).
- Compute power and Laurent series expansions from a real-world problem using simple, memorized power series.
- Truncate a series properly at a given order by keeping all the terms up to that order and none of the terms of higher order.
- Discuss in detail the relationship between the graphical, algebraic, and power series representations of the potentials.