Equipotentials and Electric Fields

Activity Overview

In this activity, students will explore the concept of equipotentials near point charges and the relationship between equipotentials and electric fields. Students will plot equipotentials near a single positive charge, near two positive charges, and near a positive and a negative charge.

Notes:

- The first few pages in the .tns file contain background information. The file is designed to be a combination of a tutorial and a simulation. Students are given instructions at each stage of the activity. Students are asked to respond to questions designed to help them focus on key characteristics.
- Students should not attempt to move the circles representing the charges. Only the point which marks location should be moved. To grab this point, move the cursor over it until the cursor turns into an open hand. Press and hold the center button on the NavPad until the hand closes on the point.
- To plot points for the equipotentials, hold the Ctrl button and press the decimal point button. Points should be close enough together that a reasonably smooth curve is formed, but they should not be so close that plotting the equipotential takes an excessive amount of time. If an incorrect point is plotted, it may be removed by going to the Lists & Spreadsheet page containing the data and deleting the x and y coordinates of the last entry.
- Because lines connect each successive point plotted, there will be a connecting line between two different equipotential curves. Students should ignore this connecting line.
- Students may find it helpful to zoom-in when plotting equipotentials near the charges. The electric potential changes rapidly near the charges, and students may have difficulty finding points with the exact potential values suggested. Students may plot points within +/- 0.4V of the suggested value.
- At the end of the file students are asked to identify rules relating electric fields to equipotentials. Through this activity, students should observe that (1) the electric field is always perpendicular to an equipotential curve, (2) the magnitude of the electric field is large where electric potential changes rapidly over a short distance and smaller where the change is more gradual, and (3) the electric field always points toward lower values of electric potential.

Sample Screen Shots