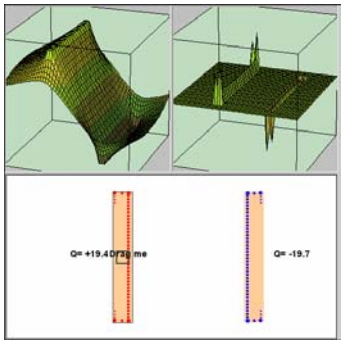
Worksheet for Exploration 26.2: Capacitors, Charge, and Electric Potential



This animation shows a parallel-plate capacitor and the charges on the plates, the total charge, and the electric potential difference between the plates. You can move the left plate by click-dragging the middle of the plate (at the "Drag Me" label). The plots show you the electric potential and charge as a function of (x, y) position **(position is given in centimeters, charge is given in coulombs, electric field strength is given in N/C, and electric potential is given in volts)**. You can click-drag in a graph to rotate the plot and see it from a different angle.

a. Which plot corresponds to electric potential as a function of position? Which one is charge as a function of position? Explain how you know.

b. From the charge plot, where is there the most charge on the plates? Why?

Consider the configuration with a constant electric potential difference between the plates.

c. How does the charge change as you move the left capacitor plate? Explain.
   i. Think about what must happen to keep the potential constant.

d. Does this result correspond to a capacitor connected to a battery or a charged capacitor disconnected from a battery? Explain.

Now consider the configuration with a constant charge on the plates.

e. How does the voltage difference between the plates change as you move the left capacitor plate? Explain. (Note: If the animation says "Failed to converge" after you move the plates, simply click on the plate again to have the animation re-calculate. The charge will stay in about the same range.)

f. Does this correspond to a capacitor connected to a battery or a charged capacitor disconnected from a battery? Explain.

g. Consider the 3D plot for electric potential. Also consider how E field relates to that. For each configuration what happens to the electric field and to the 3D plot in the region between the plates as you bring the plates closer together?