Electric Field Mapping

Name: ______________________________

Instructor: ______________________________

Team Member 1	Team Member 4
Team Member 2	Team Member 5
Team Member 3	Team Member 6

Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for each step. Box final mathematical results. Do not forget units!

1 Data

1.1 Parallel Plate Capacitor

1. Set the DC power supply to 10 V.
2. Follow the instructions in the lab manual to find and record equipotential curves for integer potential differences from 1 V to 9 V. Be sure that the values of the equipotentials can be easily distinguished.
3. Verify with your instructor that you have enough data. They will be looking for adequate coverage between the plates, outside the plates, and about the regions where edge-effects occur.
4. Make copies of your recorded data.

1.2 Cylindrical Capacitor (Coaxial Cable)

1. Set the DC power supply to 5 V.
2. Follow the instructions in the lab manual to find and record equipotential curves for half-integer potential differences from 0.5 V to 4.5 V. It may be difficult or impossible to get to 4.5 V, but do the best you can. Be sure that the values of the equipotentials can be easily distinguished. Ask your instructor as needed.
3. Verify with your instructor that you have enough data. They will be looking for adequate coverage inside the cylinder and outside the cylinder.
4. Make copies of your recorded data.

2 Analysis

2.1 Parallel Plate Capacitor

1. Follow the directions in your lab manual for sketching the electric field on your data sheet.
2. Locate and mark the most direct electric field line on your data. You will use this as a sample of your data for the remainder of this section.
3. Make a table that records ΔV_g (potential difference relative to ground), ΔV_r (potential difference relative to the next more negative equipotential), x (distance relative to the positive electrode), Δx (change in distance between the current equipotential and the next more negative one), and E_{avg} (the average electric field calculated using Equation 3). Consult your lab manual and ask your instructor if this is unclear.

4. Plot ΔV_g versus x. Find the equation for a linear best-fit and note that the slope is E the magnitude of the electric field. Calculate the electric field inside the parallel plate capacitor from theory. Compare the theoretical field to the electric field given by the slope of the best-fit line.

5. Plot the electric field versus distance.

2.2 Cylindrical Capacitor (Coaxial Cable)

1. Follow the directions in your lab manual for sketching the electric field on your data sheet.

2. Locate and mark the most direct electric field line on your data. You will use this as a sample of your data for the remainder of this section.

3. Make a table that records ΔV_g (potential difference relative to ground), ΔV_r (potential difference relative to the next more negative equipotential), x (distance relative to the positive electrode), Δx (change in distance between the current equipotential and the next more negative one), and E_{avg} (the average electric field calculated using Equation 3). Consult your lab manual and ask your instructor if this is unclear.

4. Plot ΔV_g versus x. Estimate the slope of the tangent line at each point graphically and note that each is an E_{avg}. Compare these to the E_{avg} values you tabulated earlier.

5. Plot the electric field versus distance.

6. Compare your plot for electric field versus distance plot for each set-up. (No math here... just discuss what you see in some educated way.)