Lab 2: Electric Field and Potential

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1 Purpose

To study the relationship between electric field and the electric potential difference associated with it.

2 Theory

The relationship between the electric field and electric potential difference will follow the equation $\Delta V = -\int_a^b \vec{E} \cdot ds$, which simplified is $\Delta V = \frac{k_e q}{r}$. This means electric potential will have a opposite yet linear relationship with the electric field, while having an inverse relationship with distance.

3 Experiment Analysis

4 Procedure

5 Data and Graphs

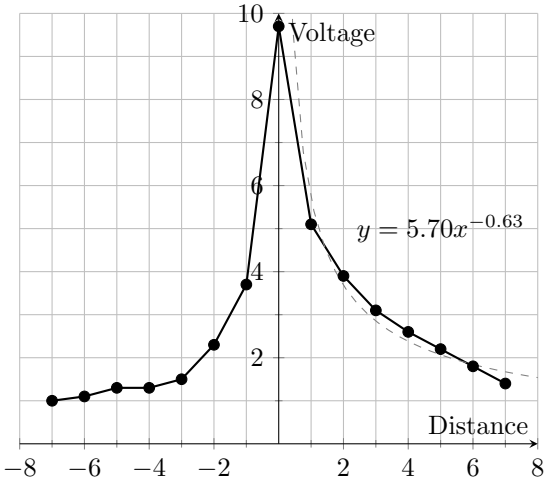
5.1 Part 1

[**Table 1.1**] Part 1: Single Point Charge in a 0V Ring

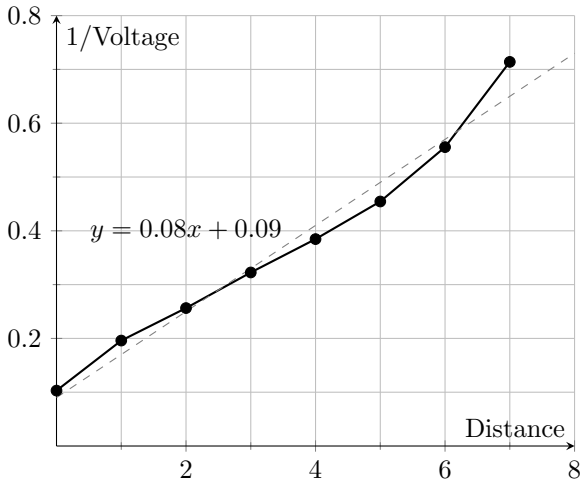
Distance (cm)	Voltage (V)
-7	1
-6	1.1
-5	1.3
-4	1.3
-3	1.5
-2	2.3
-1	3.7
0	9.7
1	5.1
2	3.9
3	3.1
4	2.6
5	2.2
6	1.8
7	1.4

[**Table 1.2**] Table 1.1 With Inversed Voltage

Distance (cm)	1/Voltage (1/V)
0	0.103
1	0.196
2	0.256
3	0.323
4	0.385
5	0.455
6	0.556
7	0.714

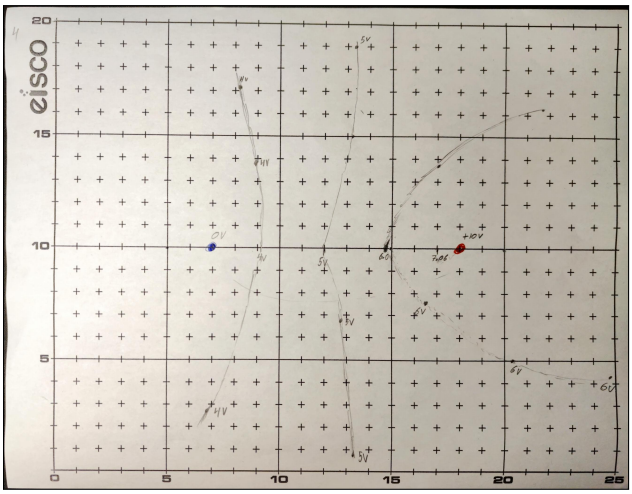


[**Fig 1.1**] Table 1.1 visualized in a graph.



[**Fig 1.2**] The linearization of Fig 1.1.

5.2 Part 2



6 Results

7 Questions

7.1 Part 1

1. Which function will describe the behavior?
2. Fit it with the best fit line. What does the coefficient in the equation given by excel mean?
3. Paste your graph with fitting line here.

7.2 Part 2

1. Choose two equipotential points and calculate the electric filed
2. Include a picture of your equipotential lines for this configuration here. With a pen or marker of different color draw the electric field lines.
3. Do equipotential lines cross? Why or why not?

4. Which direction does the electric field point with respect to equipotential? Does E point to high or low electric potential?

5. In this final step we will combine the direction information given by the equipotentials with the magnitude information from the measured potential differences discussed above. First estimate the magnitude and record your results in this chart.

7.3 Part 3

1. Use a copy of the conductive paper to write down the different voltages at different locations around. Using the equipotential lines you've drawn, draw the approximate electric field lines.

2. Given the voltage difference between the two plates and the separation distance what is the magnitude of the electric field inside the plates? Do this calculation using at last three combinations of equipotential lines.

3. Include a photo of the equipotential lines and the electric field that you found for this configuration.

8 Conclusion