Lab 1: Work Sheet

Name: Date:

The software to be used is EEESOFT. There is a shortcut on the desktop. If it does no show on the desktop, use Find to locate the applcation file eeesoft.exe and run the program by double clicking on it. The samples used in the lab are 2, 4, 6.

1 Conversion of a Vector from Cartesian Coordinates to Spherical Coordinates

Choose the sample 2 from the main menu. Check your answers for the vectors in Part 1 of prep sheet using the software and answer the following questions:

1. At a point on the z-axis other than the origin, a vector has no z component. What component(s) does it have in spherical coordinates?

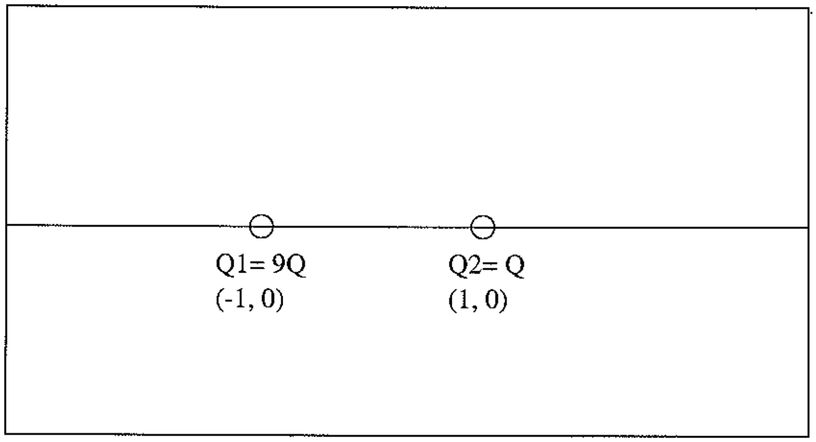
2. If a vector $\vec{A}$ at point P has only $\vec{a_r}$ component, what property do $\vec{A}$ and P have? Give another 2 examples with the same property.

3. Use the software to find out the following vectors in spherical coordinates.
Vector (3, 4, -5) at point (3, 4, 5)
Vector (2, 2, -2) at point (1, 1, 2)

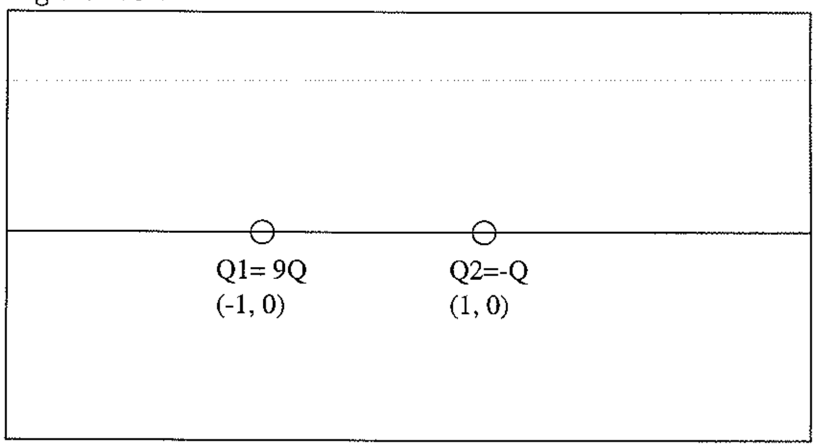
2 Direction Lines of Electric Field Due to Point Charges

Choose sample 4 from the main menu. Try the examples in the software. You can also run the example by inputting values for the point charges.

1. Plot the field lines of the Q1 = 9Q and Q2 = Q.



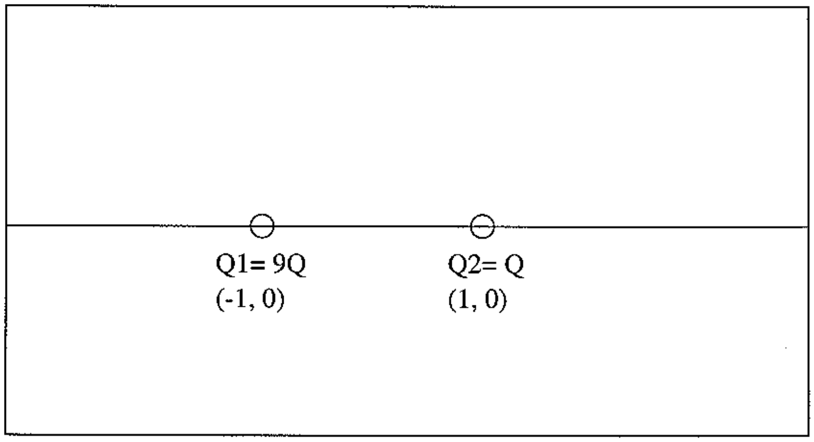
2. Plot the field lines of the Q1 = 9Q and Q2 = - Q. Plot an additional field line starting from Q1 at an angle of 45°.



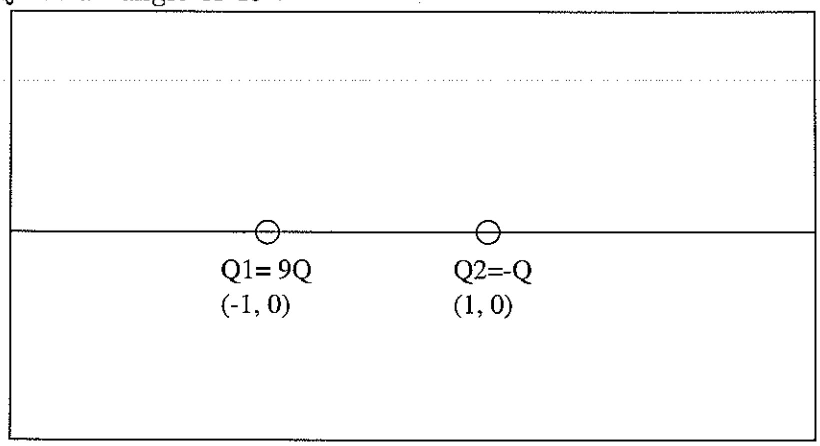
3 Equipotential Lines Due to Point Charges

Choose sample 6 from the main menu. Try the examples in the software.

1.Plot the equipotential lines of the Q1 = 9Q and Q2 = Q.



2. Plot the equipotential lines of the Q1 = 9Q and Q2 = - Q. Plot an equipotential line starting from Q1 at an angle of 45°.



3. Assume Q1 is the positive charge at (-1, 0) and Q2 is the negative charge at (1, 0). Let k be the ratio of the $\mid Q1 \mid$ to $\mid Q2 \mid$. $k > 1$. Prove that the potential along the x-axis has a maximum in the range of $(1,\infty)$ and the coordinate at the maximum can be expressed as

$$x = \frac{\sqrt{k}+1}{\sqrt{k}-1}$$