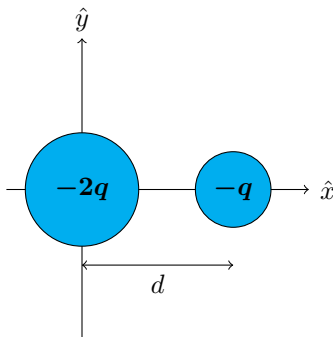


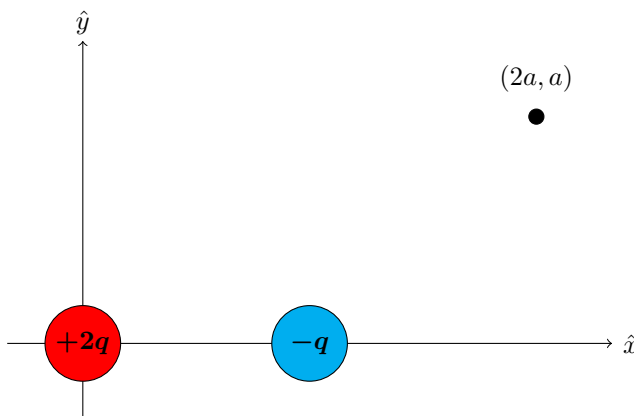
Chapter 21 - Electric Charge and Electric Field - Part 2

Physics 207

1. A charge of magnitude $-2q$ is fixed at the origin. A second charge, $-q$, is fixed at a distance d away from the origin on the positive x -axis. Find any positions on the x -axis where the electric field is exactly zero.



2. Two charges are placed in the configuration below at the origin and $(a, 0)$ respectively. Find the electric field vector at the point $(2a, a)$.

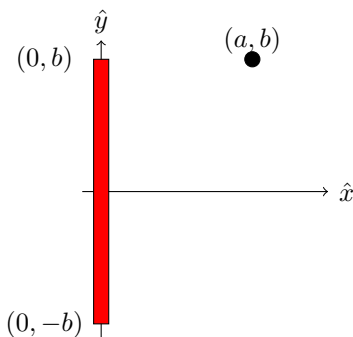


3. A $-170 \mu\text{C}$ charge is located at $(-2.00, 0.00)$ and a $100 \mu\text{C}$ charge is located at $(0.00, -5.00)$. There is a uniform, external electric field $\vec{E} = 30000\hat{i}$ (in SI units). All positions are given in units of m.

- What is the net electric force vector acting on the $-170 \mu\text{C}$ charge?
- What is the magnitude and direction of the net electric force acting on the $100 \mu\text{C}$ charge?
- What is the net electric field vector at the point $(0.00, 3.00)$?

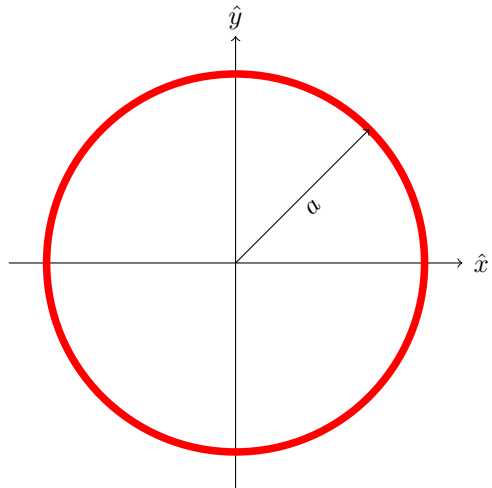
4. A thin rod with uniform charge $+Q$ is placed with one end at $(0, b)$ and the other end at $(0, -b)$.

- Set up the two, well-defined integrals that you would solve to find the components of the electric field at the point (a, b) . Do not actually evaluate the integrals, just set them up.
- If a point charge $+2q$ is then placed at (a, b) , modify the integrals you found in part (a) to find the force vector **felt by the rod** due to the $+2q$ charge.



5. Consider a thin, hollow tube of length ℓ , radius R and total charge Q that is uniformly distributed along the surface. The tube is oriented so that the central axis is along the z -axis. The tube runs from $0 \leq z \leq \ell$. Set up the well-defined integral that you would solve to find the electric field at the coordinate $(0, 0, z_0)$. Make sure that your result will make sense if $z_0 < 0$, $0 < z_0 < \ell$ or $z_0 > \ell$.

6. An insulating ring of charge with radius a has a charge density $\lambda(\theta) = \lambda_0 \sin \theta$ where θ is measured counterclockwise from the positive x -axis. What is the electric field vector at the origin?



7. Consider a system of identical point charges q that are evenly spaced by a distance d starting at the origin and continuing infinitely along the negative x -axis. The point P is the same distance d to the right of the origin. Does the electric field at the position P converge to a specific value? If so, what is that value?

