

Workbook



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Coulombs Law

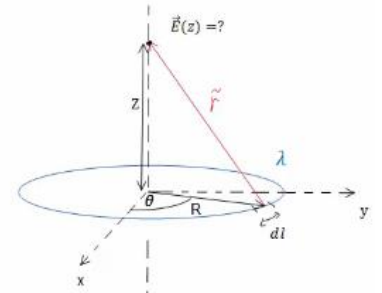
Coulombs Law

Questions

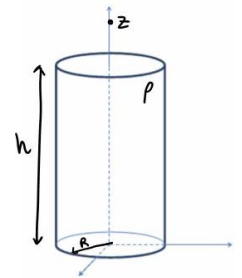
- 1) An infinite wire is charged with charge density per unit length λ . The wire is bent to form a semi circle of radius R at the bend. What is the electric field at the center of the semi circle?



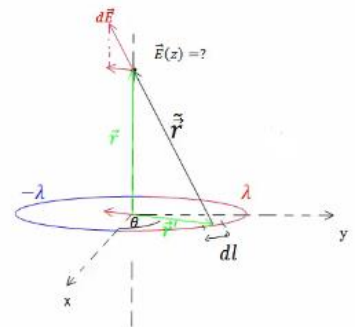
- 2) a. Calculate the electric field along the axis of symmetry of a ring of radius R and charge density per unit length λ .
 b. Calculate the electric field along the axis of symmetry of a disk of radius R and charge density per unit surface area σ .



- 3) Given is a full cylinder of height h , radius R and charge density ρ . What is the electric field at some point z above the center of the cylinder?

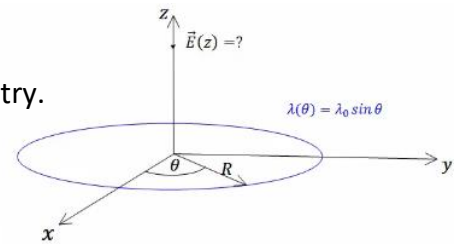


- 4) We are given a ring of radius R . One half of the ring has charge density per unit length λ , the second half has $-\lambda$. Find the electric field along the ring's axis of symmetry.

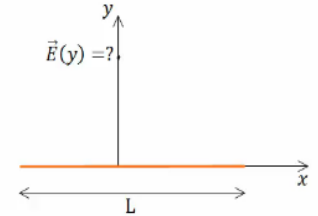


- 5) A ring of radius R has a non-uniform charge density, which is dependent on the angle between the x axis according to $\lambda(\theta) = \lambda_0 \sin \theta$.

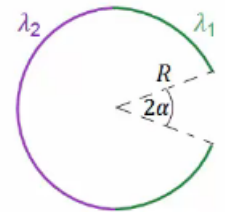
- What is the total charge of the ring?
- Find the electric field at each point on the ring's axis of symmetry.
- What is the electric field when $z \gg R$?
What type of electric field is this?



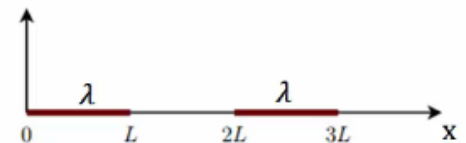
- 6) A wire of length L has charge Q uniformly distributed along its length. Calculate the electric field along the axis perpendicular to the wire, located at its center.



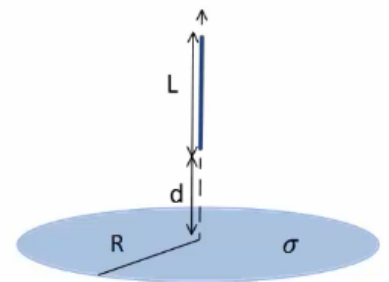
- 7) A ring of radius R has charge density λ_1 on its right hand side and charge density λ_2 on its left hand side. The right hand side has a piece missing, formed by the angle 2α . What is the electric field at the center of the ring?



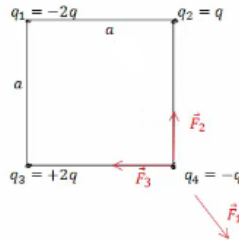
- 8) Two rods of length L are charged with uniform charge density λ . Both rods are placed along the x -axis, as shown in the diagram. Find the forces acting on the rods.



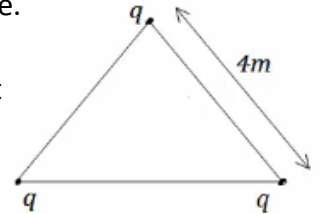
- 9) A solid disk of radius R has charge density per unit area, σ . A rod, of length L is placed along the disk's axis of symmetry, and at a height d above its center. The rod has charge density per unit length, λ . What force does the rod exert on the disk?



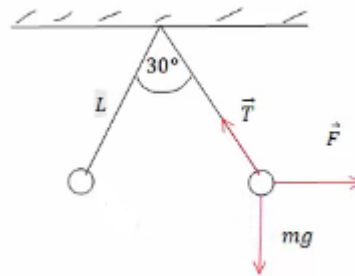
- 10) Calculate the force acting on a charge located at the bottom right hand corner of a square. q and a are given.



- 11) Three identical charges are located at the corners of an equilateral triangle. The magnitude of each charge is $q = 2\mu\text{C}$ and the length of each edge of the triangle is 4m . Find the force that each charge experiences as a result of the other charges in the system.



- 12) Two balls of mass m and identical charge are hung from the ceiling via strings of length L . The angle between the strings is 30° . What is the charge on each ball?



- 13) Electrons enter a cathode ray tube at a velocity V . Inside the tube there is a constant electric field in the two direction perpendicular to the velocity of the electrons. The length of the tube is d . Calculate the electron's point of impact on the screen, located at a distance L from the tube's opening. Assume that $d \ll L$ and that the electron mass and charge is given.

*For the solution go see the videos