

Electrostatics

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1 Electric Charge

Electric Charge is that property of a body due to which it interacts with other charges. There are three types of charges:-

- Positive Charges
- Negative Charges
- Neutral Charges

S. I. unit of electric charge is ‘C’ – Coulomb.

2 Coulomb’s Law

Force between two charges q_1 and q_2 is $F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$, with r being the distance between them.

3 Electric Field

It is the net force per unit positive charge

$$\vec{E} = \frac{\vec{F}}{q}$$

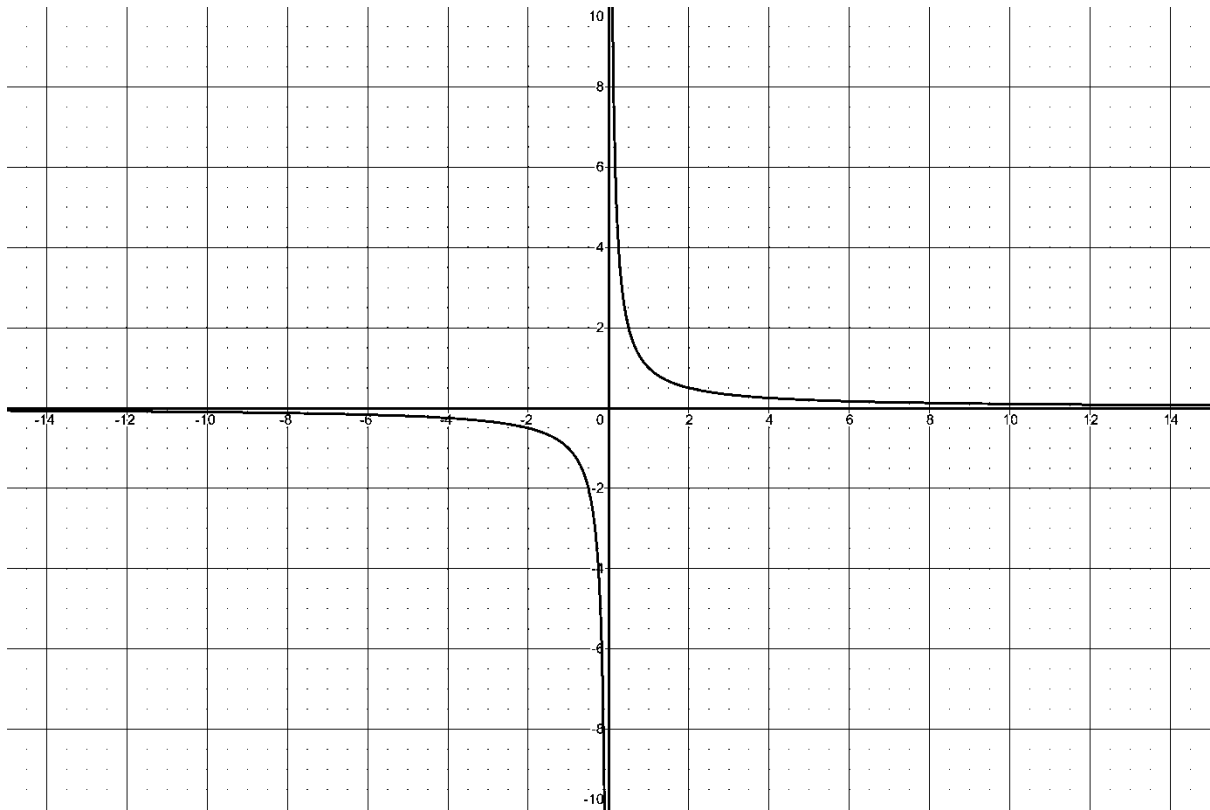
the S. I. unit of Electric Field is N/C .

Electric Field due to

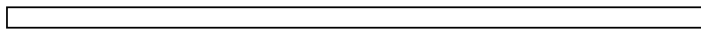
1. A point charge (q)

$$E = \frac{kq}{r^2}$$

The plot of the Electric field (\vec{E}) versus radial distance (r) is given below.

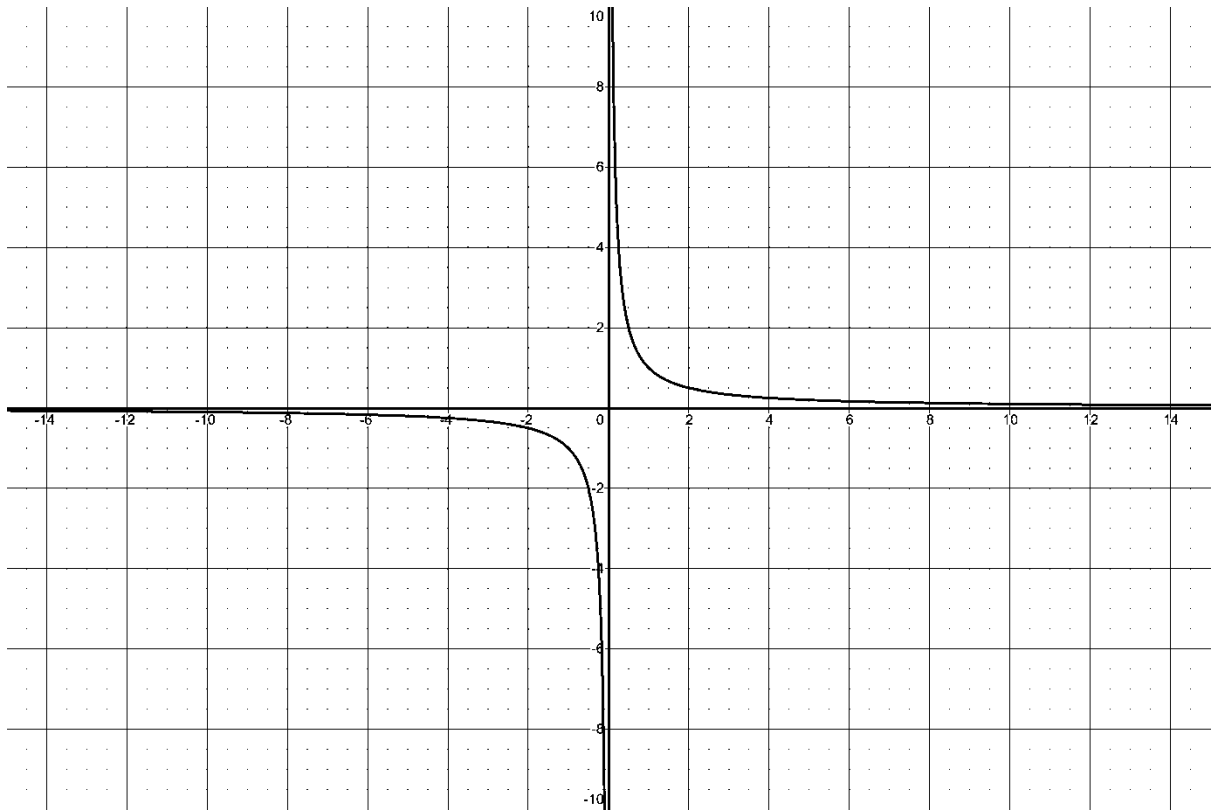


2. A linear charged rod of charge (q) and length (l) at a distance d from the end of the rod.

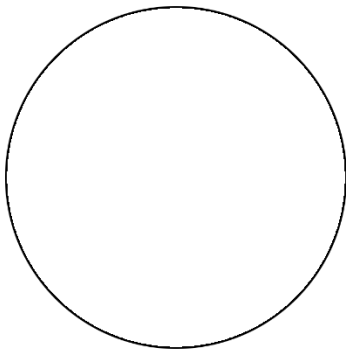


$$E = \frac{kq}{l} \left(\frac{1}{d} - \frac{1}{d+l} \right)$$

The plot of the Electric field (\vec{E}) versus radial distance (r) is given below.



3. A charged conducting sphere of charge (q) and radius (R)



$$E = \begin{cases} \frac{kq}{r^2}, & \text{for points outside the sphere, that is } r > R. \\ \frac{kq}{R^2}, & \text{for points on the surface of the sphere, that is } r = R. \\ 0, & \text{for points inside the sphere, that is } r < R. \end{cases}$$