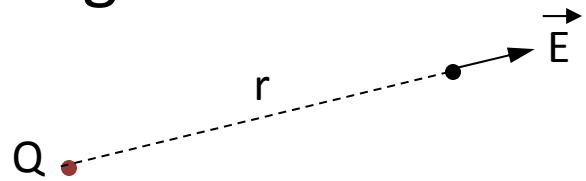
More Electric Fields

Calculate the electric field due to the source charges

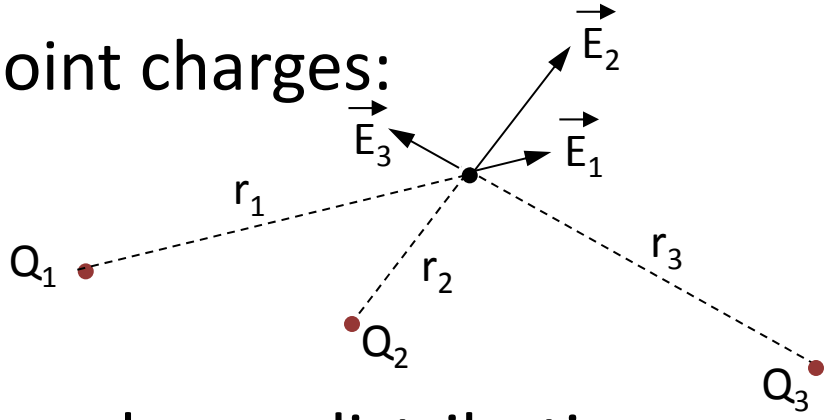
Electric field due to a point charge:

$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}\hat{r}$$



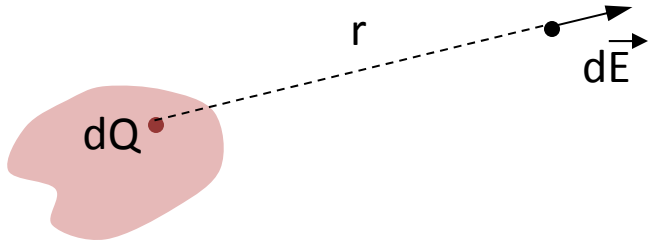
Electric field due to several point charges:

$$\vec{E} = \sum_i \frac{1}{4\pi\varepsilon_0}\frac{Q_i}{r_i^2}\hat{r}_i$$



Electric field due to continuous charge distribution:

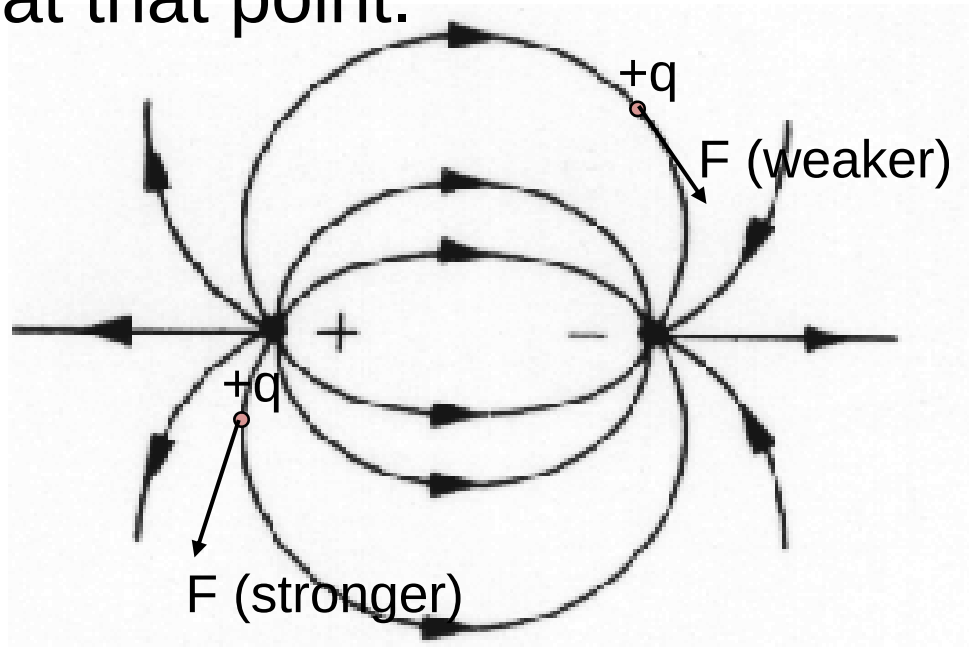
$$\vec{E} = \int d\vec{E} = \int \frac{1}{4\pi\varepsilon_0}\frac{dQ}{r^2}\hat{r}$$



Class 7 Electric Field Lines and Electric Flux

Properties of field lines I

1. To visualize the electric field, we draw field lines. When we put a *positive* test charge in the electric field, the force acting on it will be tangent to the field line at that point. The magnitude of the force will be proportional to the density of field lines at that point.

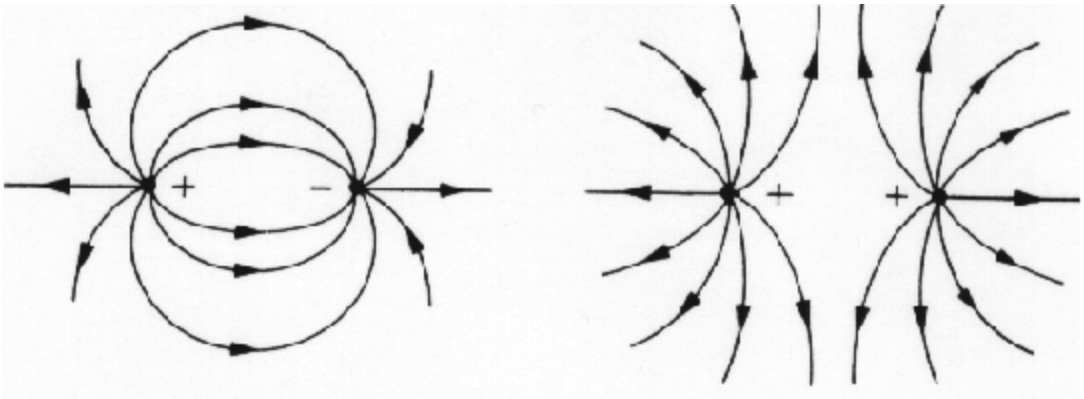


Properties of field lines II

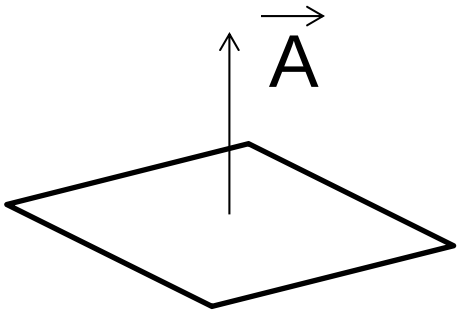
2. Electric field lines are continuous lines only terminate at charges or at infinity.

3. When an electric field line terminate at charges, it always comes out from a positive charge, or getting into a negative charge.

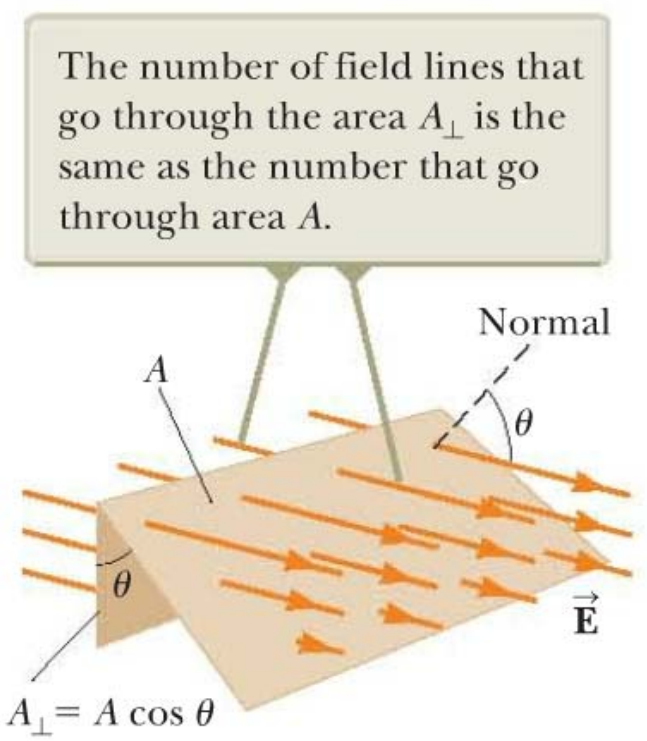
4. Field lines never cross each other.



Area vector and Flux



Area vector is a vector perpendicular to a plane surface with magnitude equals to the area of the plane.



$$\text{Flux } \Phi_E = \mathrm{E\ A}\cos\theta = \vec{\mathrm{E}}\cdot\vec{\mathrm{A}}$$