

List of electric fields

The following fields are important models of the electric field.

Point Charge

$$\vec{E} = \frac{kq}{r^2}, \text{ in the radial direction}$$

Sphere of charge q and radius R

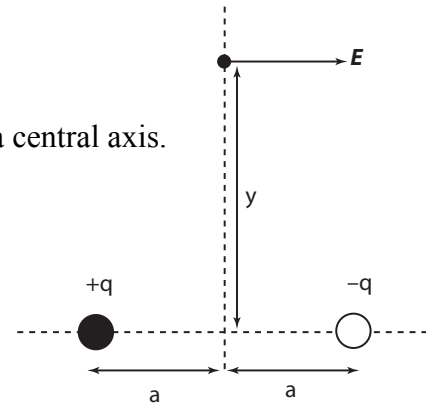
Same as a point charge, for $r > R$.

Electric dipole

Two charges of equal but opposite sign, each a distance a from a central axis.

The field at a distance y from the midpoint of the dipole is:

$$\vec{E} = \frac{2kqa}{(y^2 + a^2)^{3/2}} \hat{i}$$



Infinite line of charge

The field at a distance r from an infinite line of charge density λ is:

$$\vec{E} = \frac{2k\lambda}{r}, \text{ perpendicular to line}$$

Infinite plane of charge

The field for an infinite plane of charge density σ , does not depend on distance:

$$\vec{E} = \frac{\sigma}{2\epsilon_0}, \text{ perpendicular to plane.}$$

$$\text{Note: } k = \frac{1}{4\pi\epsilon_0}$$

Uniform ring of charge

The field at a point P lying a distance x from the center along the axis perpendicular to the plane of a ring of radius r and charge Q is:

$$E_x = \frac{kQx}{(x^2 + r^2)^{3/2}}$$

Uniform disk of charge

A disk of radius R and charge density σ , will create a field at a point P lying a distance x from the center along the axis perpendicular to the plane of the ring:

$$E_x = 2\pi k\sigma \left(1 - \frac{x}{\sqrt{x^2 + R^2}}\right)$$

