

Write something you know about the electric field of a point charge

**Solution** The electric field of a point charge  $q$ :

- is a vector field;
- is proportional to the charge;
- falls off inversely like the square of the distance from the charge;
- points directly away from a positive charge or directly towards a negative charge
- has dimensions  $\left[ \frac{1}{Q} \frac{ML}{T^2} \right]$ ;
- is given by the formula:

$$\vec{E}(\vec{r}) = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2} \hat{r}$$

- is related to the force on a test charge by  $\vec{F} = q_{test}\vec{E}$ ;
- is related to the electrostatic potential by

$$\vec{E}(\vec{r}) = -\vec{\nabla}V(\vec{r})$$

- See these rotatable graphs for a graph of this vector field (bottom right).