

# Electric Field of Continuous Charge Distribution



- Divide the charge distribution into infinitesimal blocks.
  - For 3D applications use charge per unit volume:  $\rho = \Delta Q / \Delta V$ .
  - For 2D applications use charge per unit area:  $\sigma = \Delta Q / \Delta A$ .
  - For 1D applications use charge per unit length:  $\lambda = \Delta Q / \Delta L$ .
- Use Coulomb's law to calculate the electric field generated by each block.
- Use the superposition principle to calculate the resultant field from all blocks.
- Use symmetries whenever possible.

$$d\vec{E}_i = k \frac{dq_i}{r_i^2} \hat{r}_i$$
$$\vec{E} = \sum_i d\vec{E}_i \rightarrow k \int \frac{dq}{r^2} \hat{r}$$

