Electric Field of Continuous Charge Distribution

- Divide the charge distribution into infinitesimal blocks.
  - For 3D applications use charge per unit volume: \( \rho = \frac{\Delta Q}{\Delta V} \).
  - For 2D applications use charge per unit area: \( \sigma = \frac{\Delta Q}{\Delta A} \).
  - For 1D applications use charge per unit length: \( \lambda = \frac{\Delta Q}{\Delta L} \).

- 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.

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