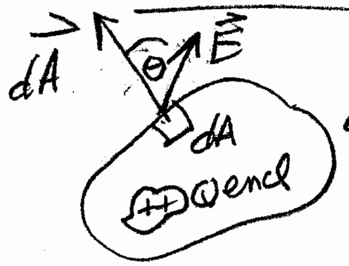
CH22 SUMMARY

Gauss's LAW



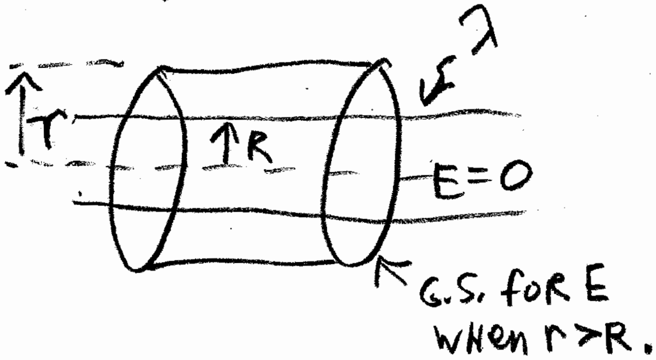
closed surface

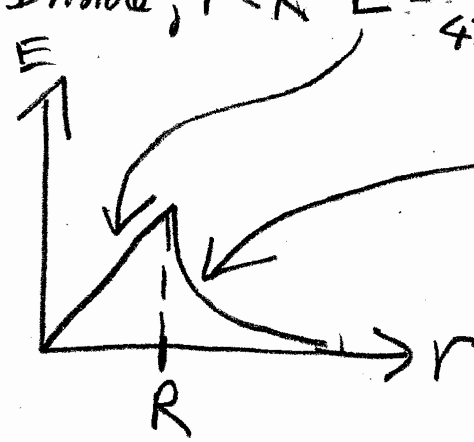
$$\oint \vec{E}\cdot d\vec{A} = \oint E\,dA\cos\theta = \frac{Q_{encl}}{\varepsilon_0}$$

Electric field of different charge distributions; fields are caused by symmetric charge distributions. q, Q, λ and σ refer to magnitudes.

Charge distribution	Point in Electric Field	Electric Field magnitude
Point charge q p 734	Distance r from q	$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r^2}$
Charge q on surface of conducting sphere of Radius R: Example 22.5	outside: $r > R$ inside: $r < R$	$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r^2}$ $E = 0$
Infinite wire, charge per unit length λ: Example 22.6	Distance r from wire	$E = \frac{1}{2\pi\varepsilon_0}\cdot\frac{\lambda}{r}$

Charge distribution	Point in electric field	Electric field magnitude
Infinite conducting cylinder with radius R, charge per unit length λ	outside, $r > R$	$E = \frac{1}{2\pi\epsilon_0} \cdot \frac{\lambda}{r}$
	inside, $r < R$	$E = 0$
Solid insulating sphere with radius R, charge Q distributed uniformly throughout volume: Example 22.9	outside, $r > R$	$E = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q}{r^2}$
	inside, $r < R$	$E = \frac{1}{4\pi\epsilon_0} \cdot \frac{Qr}{R^3}$





Charge distribution	Point in Electric Field	Electric Field Magnitude
Infinite sheet of charge with uniform charge per unit area σ: Example 22.7	any point	$E = \frac{\sigma}{2\epsilon_0}$
Two oppositely charged conducting plates with surface charge densities $+\sigma$ and $-\sigma$: Example 22.8	any point between plates	$E = \frac{\sigma}{\epsilon_0}$
Charged conductor: p. 744	just outside conductor	$E = \frac{\sigma}{\epsilon_0}$