

Unit 20.5 – 20.7

Last time:

- Field lines
 - ⇒ # of lines is directly proportional to the magnitude of the charge.
- Flux, $\phi_E = \vec{E} \cdot \vec{A} = EA \cos \theta$
 - ⇒ Flux is directly proportional to the # of lines passing through (at) the surface of an area.

Let's combine these two concepts together:

⇒ The flux at the boundary of a closed surface is directly proportional to the total charge enclosed by the surface boundary.

Gauss' Law:

$$\phi_E \propto q_{enclosed}$$

$$EA \cos \theta \propto q_{enclosed}$$

(We'll find the proportionality constant in **Unit 20.8**)

Some terms and “rules”:

- 1) You can pick any surface area shape you want, but it must be a closed surface area (encloses a volume).
- 2) The surface area is called a **Gaussian surface**
- 3) The unit area vectors of the surface always point outward.
- 4) \vec{E} field lines pointing from inside to outside $\Rightarrow +\phi_E$
 \vec{E} field lines pointing from outside to inside $\Rightarrow -\phi_E$