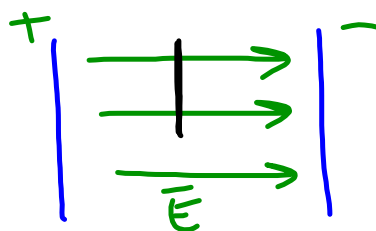
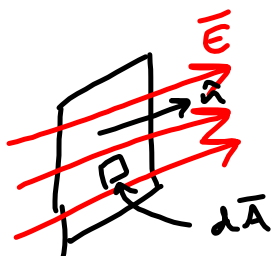


# Flux



$$d\vec{A} = \hat{n} dA$$

$$\oint \vec{E} \cdot d\vec{A} = \frac{q_{\text{inside}}}{\epsilon_0}$$

## Ampere's Law

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \sum I_{\text{enclosed}}$$

Applications:

- Choose (mathematical) closed path as boundary.

- Move around boundary, integrating

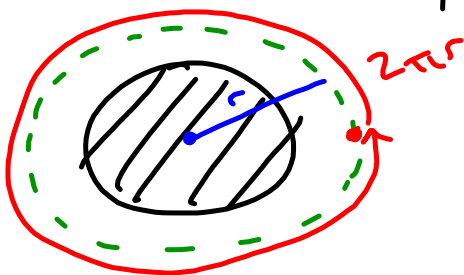
$$\oint \vec{B} \cdot d\vec{l}$$

- Add positive and negative currents that pierce imaginary soap film.

- Apply Ampere's law.

Long, thick Wire

I out of page



$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$$

$$B(2\pi r) = \mu_0 I$$

$$B = \frac{\mu_0 I}{2\pi r} = \frac{\mu_0}{4\pi} \frac{2I}{r}$$