

Tips on finding boundary conditions in Electrostatics

Charge distributions of finite spatial extent:

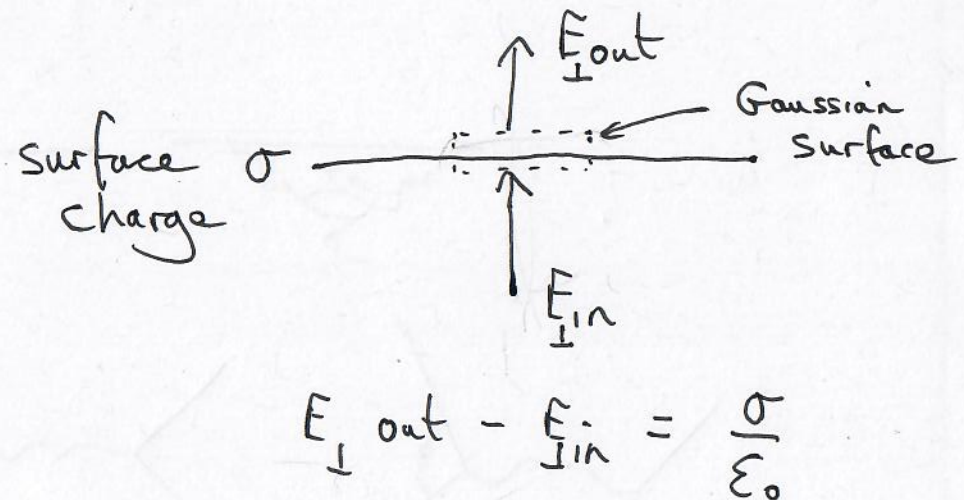
- Their contribution to $V \rightarrow 0$ as $R \rightarrow \infty$

In the absence of point charges V must be finite

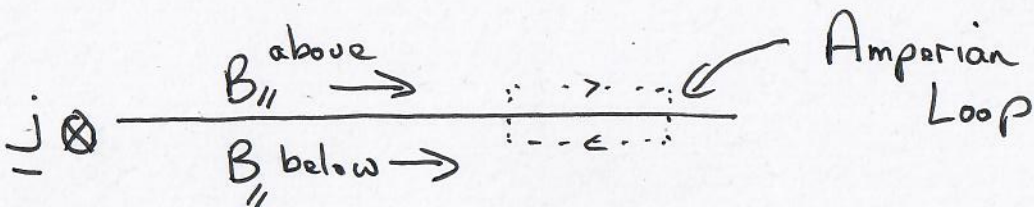
In the presence of a surface charge density σ

- V must be continuous
- $E_{\parallel}$ must be continuous

- $\Delta E_{\perp} = \frac{\sigma}{\epsilon_0}$



Boundary Conditions in Magnetostatics

Surface current density: $\underline{j} \otimes$ 

$$B_{\parallel}^{\text{above}} - B_{\parallel}^{\text{below}} = \mu_0 j$$

↑
component $\parallel$ to surface but $\perp$ current

$B_{\perp}$ to surface must be continuous

A must be continuous.

Similar "physics" considerations can be applied as in Electrostatics to ensure that:

- 1) the influence of current densities of finite spatial extent $\rightarrow 0$ as $R \rightarrow \infty$
- 2) A, B remain finite as e.g., $R \rightarrow 0$