Integral Form of Maxwell's Equations

Much of this section is covered in the 2nd Year Electromagnetism module so I encourage you to recap that module first.

I will simply list the equations here. If you want to know the derivations, look at the Electromagnetism notes.

Gauss' Law:

$$\int_S \underline{E} \cdot d\underline{A} = \frac{q}{\varepsilon_0}$$

integral over closed surface

No Magnetic Monopoles:

$$\int_S \underline{B} \cdot d\underline{A} = 0$$

integral over closed surface

Faraday's Law:

$$\int_S \underline{E} \cdot d\underline{l} = -\frac{\partial \Phi_B}{\partial t}$$

where $\Phi_B = \int_S \underline{B} \cdot d\underline{A}$ integral over open surface

Ampere Maxwell Law:

$$\int_S \underline{B} \cdot d\underline{l} = \mu_0 I + \mu_0 \varepsilon_0 \frac{\partial \Phi_E}{\partial t}$$

where $I = \int_S \underline{J} \cdot d\underline{A}$

and $\Phi_E = \int_S \underline{E} \cdot d\underline{A}$ integral over open surface

The next section will be the differential forms of these laws.