Essential Equations

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1 Newtons Laws

Newton‘s first law says: “Every body continues in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impressed upon it.” Newton‘s second law is

$$\vec{F} = m\vec{a} \tag{1}$$

where $\vec{F}$ is the force on a particle of mass m, and $\vec{a}$ is the particle‘s acceleration. Newton‘s second law (1) allows us to predict the future

Newton‘s third law says:“for every action, there is an equal and opposite reaction”

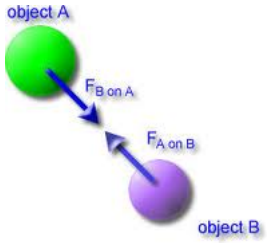

Figure 1: Newton‘s Third Law

2 Maxwells Equations

Maxwells equations include Gausss law, which reads

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q}{\epsilon_0} \tag{2}$$

in integral form.

Also included is Faraday's Law

$$\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi}{dt} \tag{3}$$

And Ampere's Law (In differential form)

$$\vec{\nabla} \times \vec{B} = \mu_0 \vec{J} + \mu_0 \epsilon_0 \frac{\partial \vec{E}}{\partial t} \tag{4}$$

And the final Maxwell equation, which seems on first glance trivial but in fact is essential.

$$\vec{\nabla} \cdot \vec{B} = 0 \tag{5}$$