Symbol	Meaning	Type of Object
$\vec{\mathbf{E}}$	Electic Field	Vector field
$\vec{\mathbf{B}}$	Magnetic Field	Vector field
ϵ_0	permitivity constant	constant
μ_0	Permeability constant	constant
c	speed of light	constant
k	Coulomb's constant: $\frac{1}{4\pi\epsilon_0}$	constant
σ	Closed orientable surface	
C	Curve	simple closed piecewise smooth curve
$\vec{\mathbf{n}}$	Outward unit normal vector, normal to the surface σ	vector-valued function
$\vec{\mathbf{T}}$	Unit tangent vector, tangent to the curve C	vector-valued function
q_{enc}	Charge enclosed by the surface	
ρ	charge density	charge per unit volume
$\vec{\mathbf{J}}$	current density vector	vector-valued function: magnitude = current per unit area, direction = same or opposite the velocity of the moving charges, depending on their sign
i_{enc}	current encircled by the closed curve C	
$\Phi_{\mathbf{E}}$	electric flux	
$\Phi_{\mathbf{B}}$	magnetic flux	
$\iint\limits_{\sigma}$ ___ dS	Surface integral; integrate with respect to the surface area of σ	
$\int\limits_{C}$ ___ ds	Line integral; integrate with respect to arc length of C; Note that integrals of the form $\oint\limits_{C} \vec{\mathbf{F}} \bullet \vec{\mathbf{T}} ds$ can also be expressed as $\oint\limits_{C} \vec{\mathbf{F}} \bullet \vec{d}\mathbf{r}$, where $\mathbf{r}(t)$ is the vector equation of C	
$\oint_C$ ___ ds	Line integral over a closed curve	
$\oint_S$ ___ $d\vec{\mathbf{A}}$	Physicist's symbol for a surface integral over a closed surface	
$\int_S$ ___ $d\vec{\mathbf{A}}$	Physicist's symbol for a surface integral over a surface that is not closed.	
$\oint_C$ ___ $\vec{ds}$	Physicist's symbol for a line integral over a closed curve.	
$d\vec{\mathbf{A}}$	"area vector"	vector-valued function; this is the outward unit normal vector scaled so that its magnitude accounts for the area of the surface; it encompasses the $\vec{\mathbf{n}}dS$ from the 3c formulas involving surface integrals
$\vec{d}\mathbf{s}$	"arc length vector"	vector-valued function; this is the unit tangent vector scaled so that its magnitude accounts for the arc length; it encompasses the $\vec{\mathbf{T}}ds$ or the $\vec{d}\mathbf{r}$ from the 3c formulas involving line integrals

Maxwell's Equations

1. Gauss' Law for Electricity	
Integral Form	Differential Form
3c $\underbrace{\Phi_{\mathbf{E}}}_{flux} = \iint\limits_{\sigma} \vec{\mathbf{E}} \bullet \vec{\mathbf{n}} dS = \frac{q_{enc}}{\epsilon_0}$ 4b $\underbrace{\Phi_{\mathbf{E}}}_{flux} = \oint_S \vec{\mathbf{E}} \bullet d\vec{\mathbf{A}} = \frac{q_{enc}}{\epsilon_0}$	$\bigtriangledown \bullet \vec{\mathbf{E}} = div(\vec{\mathbf{E}}) = \frac{\rho}{\epsilon_0}$
2. Gauss' law for magnetism	
Integral Form	Differential Form
3c $\Phi_{\mathbf{B}} = \iint\limits_{\sigma} \vec{\mathbf{B}} \bullet \vec{\mathbf{n}} dS = 0$ 4b $\Phi_{\mathbf{B}} = \oint_S \vec{\mathbf{B}} \bullet d\vec{\mathbf{A}} = 0$	$\bigtriangledown \bullet \vec{\mathbf{B}} = div(\vec{\mathbf{B}}) = 0$
3. Faraday's Law of Induction	
Ingegral Form	Differential Form
3c $\oint\limits_C \vec{\mathbf{E}} \bullet \vec{\mathbf{T}} ds = \oint\limits_C \vec{\mathbf{E}} \bullet d\vec{\mathbf{r}} = -\frac{d\Phi_{\mathbf{B}}}{dt}$ 4b $\underbrace{\oint_C \vec{\mathbf{E}} \bullet d\vec{\mathbf{s}}}_{emf} = -\frac{d\Phi_{\mathbf{B}}}{dt} = -\frac{d}{dt}\int_S \vec{\mathbf{B}} \bullet d\vec{\mathbf{A}}$	$\bigtriangledown \times \vec{\mathbf{E}} = curl(\vec{\mathbf{E}}) = -\frac{\partial \vec{\mathbf{B}}}{\partial t}$
4. Ampere/Maxwell's Law	
Ingegral Form	Differential Form
3c $\oint\limits_C \vec{\mathbf{B}} \bullet \vec{\mathbf{T}} ds = \oint\limits_C \vec{\mathbf{B}} \bullet d\vec{\mathbf{r}} = \mu_0 \epsilon_0 \frac{d\Phi_{\mathbf{E}}}{dt} + \mu_0 i_{enc}$ 4b $\oint_C \vec{\mathbf{B}} \bullet d\vec{\mathbf{s}} = \mu_0 \epsilon_0 \frac{d\Phi_{\mathbf{E}}}{dt} + \mu_0 i_{enc}$ $\oint_C \vec{\mathbf{B}} \bullet d\vec{s} = \mu_0 \epsilon_0 \frac{d}{dt}\int_S \vec{\mathbf{E}} \bullet d\vec{\mathbf{A}} + \mu_0 i_{enc}$	$\begin{aligned} \bigtriangledown \times \vec{\mathbf{B}} &= curl(\vec{\mathbf{B}}) \\ &= \mu_0 i_{enc} + \epsilon_0 \mu_0 \frac{\partial \vec{\mathbf{E}}}{\partial t} \\ &= \frac{4\pi k}{c^2}\vec{\mathbf{J}} + \frac{1}{c^2}\frac{\partial \vec{\mathbf{E}}}{\partial t} \\ &= \frac{\vec{\mathbf{J}}}{\epsilon_0 c^2} + \frac{1}{c^2}\frac{\partial \vec{\mathbf{E}}}{\partial t} \end{aligned}$

Some formulas were taken from the following website:
hyperphysics.phy-astr.gsu.edu/hbase/electric/maxeq.html

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