Useful Constants
speed of light $c = 2.998 \times 10^8\ m/s$
basic unit of charge $e = 1.602 \times 10^{-19}\ C$
gravitational constant $G = 6.674 \times 10^{-11}\ N\ m^2/kg^2$
mass of electron: $m_e = 9.109 \times 10^{-31}\ kg$
$\epsilon_o = 8.854 \times 10^{-12}\ C^2/(N\ m^2)$
$\epsilon_o = 8.854\ pF/m$
$\mu_o = 4\pi \times 10^{-7}\ T\ m/A$
$k = \frac{1}{4\pi\epsilon_o} = 8.988 \times 10^9\ N\ m^2/C^2$
$g = 9.80\ m/s^2$

Common Powers of 10		
Value	Name	Prefix
10^{-12}	pico	p
10^{-9}	nano	n
10^{-6}	micro	μ
10^{-3}	milli	m
10^{-2}	centi	c
10^{-1}	deci	d
10^{3}	kilo	k
10^{6}	mega	M
10^{9}	giga	G

Random Physics 1 equations: $\Sigma\vec{F} = m\vec{a}$
If constant acc: $x(t) = x_o + v_{ox}t + \frac{1}{2}a_xt^2$ || $v_x(t) = v_{ox} + a_xt$ || $v_x^2 = v_{ox}^2 + 2a_x\Delta x$
Work and Energy: $W_{a\ to\ b} = \int_a^b \vec{F}\cdot\vec{dl}$ || $K_b = K_a + \Sigma W$ or $(K_b + U_b) = (K_a + U_a) + \Sigma W_{other}$
Uniform circular motion: $a_c = v^2/r$ || Period: $T = 2\pi r/v$ || $f = 1/T$

Coulomb's Law: $F = k|q_1q_2|/r^2$

Geometry:
circle: $C = 2\pi r$, $A = \pi r^2$
sphere: $C = 2\pi r$, $A = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$
cylinder: $V = \pi r^2 h$

Cross Products
$\vec{C} = \vec{A} \times \vec{B}$
magnitude: $C = AB\sin\phi$
direction: RHR from A to B.
$C_x = A_yB_z - A_zB_y$
$C_y = A_zB_x - A_xB_z$
$C_z = A_xB_y - A_yB_x$

$$\vec{C} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

Common Integrals:
$\int x^n dx = \frac{x^{n+1}}{n+1}$ for $n \neq -1$
$\int \frac{1}{x}dx = ln(x)$
$\int e^{ax}dx = \frac{1}{a}e^{ax}$
(If you need others I will look them up.)

Current, Resistance...
$I = dQ/dt = n|q|v_dA$ $\quad J = I/A = n|q|v_d$
$\rho = E/J$ $\quad \rho = \rho_o[1 + \alpha(T - T_o)]$
$V_{ab} = IR$ where $R = \rho L/A$
$V_{ab} = \xi - Ir$
$R = \Sigma R_i$ $\quad \frac{1}{R} = \Sigma\frac{1}{R_i}$
$P = V_{ab}I = I^2R = V_{ab}^2/R$
AC: $V = V_o\sin(\omega t)$ $\quad I = I_o\sin(\omega t)$
$P_{avg} = I_{rms}V_{rms}$ $\quad I_{rms} = \frac{1}{\sqrt{2}}I_o$ $\quad V_{rms} = \frac{1}{\sqrt{2}}V_o$

$1\ Tesla = 10,000\ Gauss$ $\quad B_{earth} \approx 0.5\ G$ (more or less to the north)

Ampere's law: $\oint \vec{B}\cdot\vec{dl} = \mu_oI_{encl}$
Long wire: $B = \frac{\mu_oI}{2\pi r}$
Single loop: $B_{center} = \frac{\mu_oI}{2R}$
Interior of a solenoid: $B = \mu_oI\frac{N}{L}$
Interior of a toroid: $B = \frac{\mu_oNI}{2\pi r}$
Biot-Savart : $\vec{B} = \frac{\mu_oI}{4\pi}\int\frac{\vec{dl}\times\hat{r}}{r^2}$
Hall effect : $E_H = v_dB$, $V_H = v_dBd$

Force: $\vec{F} = q(\vec{E} + \vec{v}\times\vec{B})$
Long wire: $\vec{F} = I\vec{l}\times\vec{B}$
Segment: $d\vec{F} = Id\vec{l}\times\vec{B}$
Cyclotron $r = \frac{mv}{qB}$ $\quad f = (qB)/(2\pi m)$
$F/l = \frac{\mu_o}{2\pi}\frac{I_1I_2}{d}$