

## Formula Sheet (3rd Midterm)

Formulas	Variables	Variables continued & Constants	Picture (Visualization)
*example* $F = \frac{kq_1q_2}{r^2}$	$F$ : electric force $q_1$ : charge 1; $q_2$ : charge 2 $r$ : separation distance	$k : 8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$	
$\Phi = BA \cos \phi$			
$V_{emf} = -N \frac{\Delta \Phi}{\Delta t}$			
$V_{emf} = v \ell B$			
$V_{emf} = v(2\ell)B$			
$V_{emf} = NAB \omega \sin \omega t$ where $\omega = 2\pi f$			
$V_{emf} = -L \frac{\Delta I}{\Delta t}$			
$L = \frac{N\Phi_B}{I}$			
$L = \frac{\mu_0 N^2 A}{\ell}$			
$E = \frac{1}{2} LI^2$			
$V_{rms} = \frac{V_0}{\sqrt{2}}; I_{rms} = \frac{I_0}{\sqrt{2}}$			
$X_C = \frac{1}{2\pi f C}$			
$X_L = 2\pi f L$			
$Z = \sqrt{R^2 + (X_L - X_C)^2}$			

$\frac{V_s}{V_p} = \frac{N_s}{N_p}, \frac{I_s}{I_p} = \frac{N_p}{N_s}$			
$E_{rms} = \frac{1}{\sqrt{2}} E_0, \text{ \& } B_{rms} = \frac{1}{\sqrt{2}} B_0$			
$f = \frac{1}{2\pi\sqrt{LC}}$			
$c = f\lambda$			
$c = \frac{1}{\sqrt{\epsilon_0\mu_0}}$			
$E = cB$			
$I = \frac{E_{max} B_{max}}{2\mu_0}$			
$I = \frac{E_{max}^2}{2\mu_0 c} = \frac{c}{2\mu_0} B_{max}^2$			
$E = hf$			
$n = \frac{c}{v}$			
$n_1 \sin \theta_1 = n_2 \sin \theta_2$			
$\frac{n_2}{n_1} = \frac{d'}{d}$			
$\sin \theta_c = \frac{n_2}{n_1} \quad (n_1 > n_2)$			
$f = \frac{1}{2} R$			
$f = -\frac{1}{2} R$			

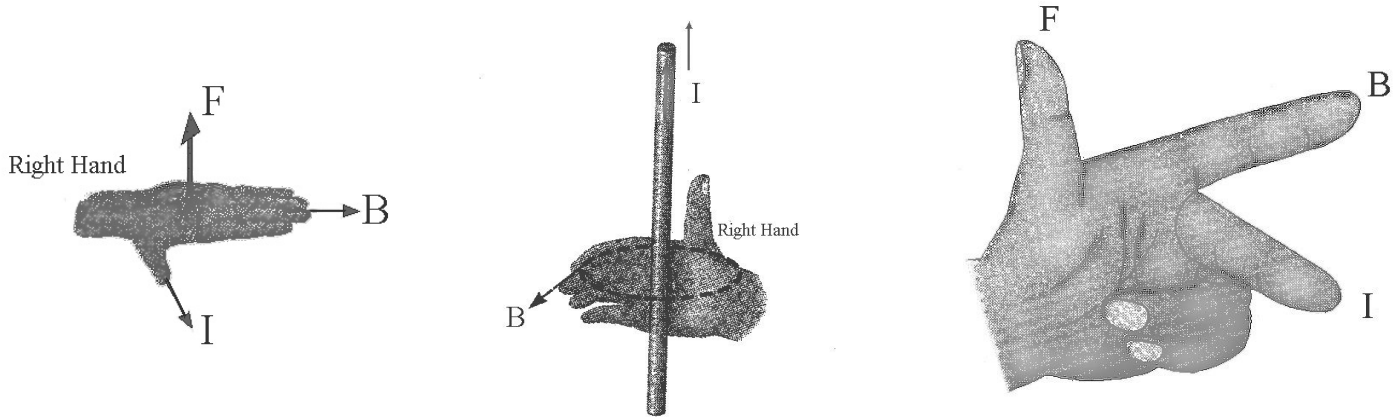
$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$			
$M = \frac{h'}{h} = -\frac{q}{p}$			

**Extra formulas from the previous chapters**

$F = q_0 v B \sin \theta$  (Lorentz force);       $F = IB\ell \sin \theta$  (Ampere's force);

$V = IR$  (Ohm's law);       $P = IV$  (Electric power);

**Right- and Left-Hand Laws**



**Appendix**

M (mega)	$\times 10^6$
k (kilo)	$\times 10^3$
m (milli)	$\times 10^{-3}$
$\mu$ (micro)	$\times 10^{-6}$