$K \equiv \frac{1}{2}mv^2$

$K = \frac{1}{2}I\omega^2$

$U - mgy$

$U = \frac{1}{2}kx^2$

$U = -\dfrac{Gm_1m_2}{r}$

$\vec{p} \equiv m\vec{v}$

$\vec{L} = I\vec{\omega}$

$\vec{L} \equiv \vec{r} \times \vec{p}$

$L = r_\perp\, p$

$x = x_o + v_o t + \frac{1}{2}at^2$

$x = x_o + \dfrac{v_o + v}{2}t$

$v = v_o + at$

$v^2 = v_o^2 + 2a\Delta x$

$\theta = \theta_o + \omega_o t + \frac{1}{2}\propto t^2$

$\theta = \theta_o + \dfrac{\omega_o + \omega}{2}t$

$\omega = \omega_o + \propto t$

$\omega^2 = \omega_o^2 + 2\propto \Delta\theta$

$v = r\,\omega$

$a_t = r\propto$

$a_c = \dfrac{v^2}{r}$

$a_c = r\,\omega^2$

$\vec{a} = \dfrac{1}{m}\sum \vec{F}$

$F_g = mg$

$F_S = k|x|$

$g = \dfrac{Gm}{r^2}$

$\vec{F} = m\vec{g}$

$F = \dfrac{Gm_1m_2}{r^2}$

$f_K = \mu_K\, F_N$

$f_s^{\text{MAX POSSIBLE}} = \mu_s\, F_N$

$\vec{\propto} = \dfrac{1}{I}\sum \vec{\tau}$

$\vec{\tau} \equiv \vec{r} \times \vec{F}$

$\tau = r_\perp\, F$

$I = mr^2$

$I = I_{cm} + md^2$

$W = F_\parallel \Delta r$

$W = \vec{F}\cdot\vec{\Delta r}$

$W = \tau\Delta\theta$

$W = -\Delta U$

$F_x = -\dfrac{dU}{dx}$

$W = \Delta K$

$P \equiv \dfrac{dE}{dt}$

$P = \vec{F}\cdot\vec{v}$

$\vec{J} \equiv \vec{F}\Delta t$

$\vec{J} = \vec{\Delta p}$

$\dfrac{d^2x}{dt^2} = -(2\pi f)^2 x$

$x = x_{\max}\cos(2\pi f t)$

$v = -v_{\max}\sin(2\pi f t)$

$a = -a_{\max}\cos(2\pi f t)$

$v_{\max} = (2\pi f)x_{\max}$

$a_{\max} = (2\pi f)^2 x_{\max}$

$T = 2\pi\sqrt{\dfrac{L}{g}}$

$T = 2\pi\sqrt{\dfrac{m}{k}}$

$f = \dfrac{1}{T}$

$\dfrac{\partial^2 y}{\partial x^2} = \dfrac{1}{v^2}\dfrac{\partial^2 y}{\partial t^2}$

$y = y_{\max}\cos\left(\frac{2\pi}{\lambda}x - \frac{2\pi}{T}t\right)$

$v = \dfrac{\lambda}{T} = \lambda f$

$v = \sqrt{\dfrac{F_T}{\mu}}$

$\mu = \dfrac{m}{L}$

$I \propto (\text{Amplitude})^2$

$f_{\text{BEAT}} = f_{\text{HIGH}} - f_{\text{LOW}}$

$f' = \dfrac{v \pm v_R}{v \mp v_S}f$

$\rho = \dfrac{m}{V}$

$P = \dfrac{F}{A}$

$P = P_o + \rho g h$

$P_G = P - P_o$

$\dot{m} = \rho A v$

$\dot{m}_1 = \dot{m}_2$

$A_1 v_1 = A_2 v_2$

$P + \frac{1}{2}\rho v^2 + \rho g h = \text{constant}$

$Q = mc\Delta T$

$Q = m\ell$

$\Delta U = Q - W$

<u>**Trigonometric Identities**</u>

$(\sin\theta)^2 + (\cos\theta)^2 = 1$

$2\sin\theta\cos\theta = \sin(2\theta)$

<u>**Constants**</u>

$g = 9.80\,\dfrac{\text{N}}{\text{kg}}$ (near earth)

$a_g = 9.80\,\dfrac{\text{m}}{\text{s}^2}$

$G = 6.67\times10^{-11}\,\dfrac{\text{N}\cdot\text{m}^2}{\text{kg}^2}$

$m_E = 5.97\times10^{24}\,\text{kg}$

$r_E = 6.38\times10^6\,\text{m}$

$I_o = 1.00\times10^{-12}\,\dfrac{\text{W}}{\text{m}^2}$

$v_{\text{sound}} = 343\,\dfrac{\text{m}}{\text{s}}$

$1.000\,\text{atm} = 1.013\times10^5\,\text{Pa}$

$\rho_{\text{water}} = 1.00\times10^3\,\dfrac{\text{kg}}{\text{m}^3}$

$1.000\,\text{cal} = 4.186\,\text{J}$

$c_{\text{water}} = 4186\,\dfrac{\text{J}}{\text{kg}\cdot\text{C}^\circ}$