Formula Sheet for Physics 2048 Final

You may use these equations freely unless a problem specifically prescribes a different approach.

$\Delta\vec{r} = \vec{r} - \vec{r}_0$	$\vec{F}_{A\,on\,B} = -\vec{F}_{B\,on\,A}$	$g = 9.80\ m/s^2$	$G = 6.67x10^{-11} Nm^2/kg^2$
$\vec{v}_{av} = \frac{\Delta\vec{r}}{\Delta t}$ $\quad \vec{a}_{av} = \frac{\Delta\vec{v}}{\Delta t}$	$\vec{v} = \lim_{\Delta t\to 0}\frac{\Delta\vec{r}}{\Delta t} = \frac{d\vec{r}}{dt}$	$\vec{a} = \lim_{\Delta t\to 0}\frac{\Delta\vec{v}}{\Delta t} = \frac{d\vec{v}}{dt}$	$a_{rad} = \frac{v^2}{r} = \omega^2 r$
$x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2$	$v_x = v_{0x} + a_x t$	$v_x{}^2 = v_{0x}{}^2 + 2a_x(x - x_0)$	$\vec{v}_{P/A} = \vec{v}_{P/B} + \vec{v}_{B/A}$
$\sum\vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}$	$f_k = \mu_k n$	$f_s \le \mu_s n$	$F_x(x) = -\frac{dU(x)}{dx}$
$W = \int_{x_1}^{x_2} F_x dx$	$W = \int_{P_1}^{P_2} \vec{F}\bullet d\vec{l}$	$W = \int_{\theta_1}^{\theta_2} \tau_z d\theta$	$P = \frac{dW}{dt}$
$W = K_2 - K_1 = \Delta K$	$\Delta K + \Delta U + \Delta U_{\text{int}} = 0$	$K = \frac{1}{2}mv^2$	$W = \vec{F}\bullet\vec{s}$
$K = \frac{1}{2}I\omega^2$	$U_g = mgy$	$U_{el} = \frac{1}{2}kx^2$	$P = \vec{F}\bullet\vec{v}$
$\vec{p} = m\vec{v}$	$\vec{J} = \vec{p}_2 - \vec{p}_1 = \int_{t_1}^{t_2}\sum\vec{F}dt$	$\vec{r}_{cm} = \sum_i m_i\vec{r}_i \Big/ \sum_i m_i$	$I = \sum_i m_i r_i^2$
$v = r\omega \quad a_{\tan} = r\alpha$	$\omega = \omega_0 + \alpha t$	$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$	$\omega^2 = \omega_0{}^2 + 2\alpha(\theta - \theta_0)$
$I_P = I_{cm} + Md^2$	$\vec{\tau} = \vec{r}\times\vec{F}$	$\sum\tau = I\alpha$	$\sum\vec{\tau} = \frac{d\vec{L}}{dt}$
$\vec{L} = \vec{r}\times\vec{p}$	$\vec{L} = I\vec{\omega}$	$P = \tau_z\omega_z$	$\omega_z = \frac{d\theta}{dt} \quad \alpha_z = \frac{d\omega_z}{dt}$
$F_g = \frac{Gm_1m_2}{r^2}$	$U = -\frac{Gm_1m_2}{r}$	$v = \sqrt{\frac{Gm}{r}}$	$T = \frac{2\pi r^{3/2}}{\sqrt{Gm}}$
$x = A\cos(\omega t + \phi)$	$\omega = 2\pi f = \frac{2\pi}{T}$	$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{g}{L}} = \sqrt{\frac{mgd}{I}}$	
$\rho = m/V$	$p = \frac{dF_\perp}{dA}$	$p = p_0 + \rho gh$	$F = -kx$
$v = \lambda f$	$y(x,t) = A\cos 2\pi(\frac{x}{\lambda} - \frac{t}{T})$	$y(x,t) = A\cos(kx - \omega t)$	$v = \sqrt{\frac{F}{\mu}}$
$\sin\theta = y/r$	$\cos\theta = x/r$	$\tan\theta = y/x$	$x = \frac{-b \pm\sqrt{b^2 - 4ac}}{2a}$
$S = 2\pi r$, $A = \pi r^2$	$A = 1/2\ b\ h$	$A = 4\pi r^2$, $V = 4/3\ \pi r^3$	$C = \sqrt{A^2 + B^2}$