Physics I
equations

$R^2 = X^2 + Y^2$ $\theta = \tan^{-1}(\frac{Y}{X})$

$\vec{v} = \frac{d\vec{r}}{dt}$ $\vec{a} = \frac{d\vec{v}}{dt}$ $\vec{p} = m\vec{v}$

for constant a:
$v = v_0 + at$ $x = x_0 + v_0 t + \frac{1}{2}at^2$
$v^2 = v_0^2 + 2a(x - x_0)$ $\bar{v} = \frac{1}{2}(v_0 + v)$

$\sum \vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}$ $\vec{F}_{ab} = -\vec{F}_{ba}$

$F_{fr} = \mu_s F_N$ or $\mu_k F_N$ $a_R = \frac{v^2}{R}$

$F_g = G\frac{m_1 m_2}{r^2}$ $\vec{F}_s = -k\vec{x}$

$W = \int \vec{F} \cdot d\vec{l}$ $K.E. = \frac{1}{2}mv^2$

potential energies:
$U_g(h) = mgh$ $U_s(x) = \frac{1}{2}kx^2$ $U_G(r) = -G\frac{m_1 m_2}{r}$

$U(r) = -\int \vec{F}(r) \cdot d\vec{r}$ $P = \frac{dE}{dt} = \vec{F} \cdot \vec{v}$ $\vec{J} = \Delta\vec{p} = \int \vec{F} dt$

Rotational Dynamics:
$\vec{\omega} = \frac{d\vec{\theta}}{dt}$ $\vec{\alpha} = \frac{d\vec{\omega}}{dt}$ $\vec{L} = \vec{R} \times \vec{p} = Rmv\sin\theta = I\omega$

$v = R\omega$ $a = R\alpha$
for constant α:
$\omega = \omega_0 + \alpha t$ $\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$
$\omega^2 = \omega_0^2 + 2\alpha(x - x_0)$ $\bar{\omega} = \frac{1}{2}(\omega_0 + \omega)$

$\tau = \vec{R} \times \vec{F} = RF\sin\theta$ $\sum \tau = I\alpha = \frac{dL}{dt}$ $K = \frac{1}{2}I\omega^2$
Constants:
g = 9.81 m/s^2 G=6.7 $\times 10^{-11}$ Nm^2/kg^2
$M_\oplus = 5.98 \times 10^{24}$ kg $R_\oplus$ = 6,398 km