Physics 120 Data & Formula sheet.

* Please note: If a formula is not on this sheet it does <u>not</u> mean you are not responsible for knowing it.

$g = 9.81\,m/s$, $\vec{V} = \frac{d\vec{x}}{dt}$, $\vec{a} = \frac{d\vec{v}}{dt}$.

For constant acceleration (1D) [Careful with signs]

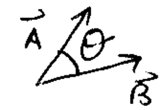
$V = V_i + a\,\Delta t$

$x - x_i = \frac{1}{2}[V_i + V]\Delta t$

$x - x_i = V_i \Delta t + \frac{1}{2} a (\Delta t)^2$

$V^2 = V_i^2 + 2a(x - x_i)$

$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$
$= |\vec{A}||\vec{B}| \cos\theta$



uniform circular motion $\frac{V^2}{r} = a$

Newton's 2nd Law $\sum_n \vec{F}_n = m\vec{a}$

Friction: $|\vec{f}_K| = \mu_K |\vec{N}|$, $|\vec{f}_{s,max}| = \mu_s |\vec{N}|$

roots of $ax^2 + bx + c$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Work: $W = \int_{x_i}^{x_f} \vec{F} \cdot d\vec{x}$, for constant force (one D-motion) $= |\vec{F}||\Delta x| \cos\theta$

$KE = \frac{1}{2} m v^2$, Power $= \frac{\Delta W}{\Delta t}$ (average) or $P = \frac{dW}{dt} = \vec{F} \cdot \vec{V}$

Work done by a conservative force $= -\Delta U$

In general $W_{ext} = \Delta KE + \Delta U + \Delta E_{Therm}$

$\vec{P} = m\vec{V}$, $U = -\int \vec{F} \cdot d\vec{x}$

$\vec{r}_{cm} = \frac{\sum_n m_n \vec{r}_n}{M}$

$\vec{V}_{cm} = \frac{\sum_n m_n \vec{V}_n}{M}$

$\vec{A} \times \vec{B} = [A_y B_z - A_z B_y]\hat{i} + [A_z B_x - A_x B_z]\hat{j} + [A_x B_y - A_y B_x]\hat{k}$

rotational motion, constant angular accel.

$\vec{\omega} = \vec{\omega}_i + \vec{\alpha}\Delta t$ $\quad \omega^2 = \omega_i^2 + 2\alpha(\theta - \theta_i)$

$\vec{\theta} = \vec{\theta}_i + \vec{\omega}_i \Delta t + \frac{1}{2}\vec{\alpha}(\Delta t)^2$

$\vec{\alpha} = \frac{d\vec{\omega}}{dt}$, $I = \sum_n m_n r_n^2$, $\vec{\tau} = \vec{r} \times \vec{F}$, $|\vec{\tau}| = |\vec{r}||\vec{F}| \sin\theta$

$\sum_n \vec{\tau}_n = I\vec{\alpha}$, $\vec{L} = \vec{r} \times \vec{p}$, $KE = \frac{1}{2} I |\vec{\omega}|^2$ $\quad \vec{\tau} = \frac{d\vec{L}}{dt}$

$V_{1f} = \left[\frac{m_1 - m_2}{m_1 + m_2}\right] V_{1i} + \left[\frac{2m_2}{m_1 + m_2}\right] V_{2i}$, $V_{2f} = \left[\frac{2m_1}{m_1 + m_2}\right] V_{1i} + \left[\frac{m_2 - m_1}{m_1 + m_2}\right] V_{2i}$

SHO: $\omega = \sqrt{\frac{k}{m}}$, $x(t) = A\cos(\omega t + \delta)$ ← mass on spring

$\omega = \sqrt{\frac{g}{L}}$, $\theta(t) = \theta_0 \cos(\omega t + \delta)$ ← simple pendulum

} $\omega = 2\pi f$, $T = \frac{1}{f}$