Formula Sheet for PHYS152

$\Delta x = x_f - x_i$

$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$

$v = \lim_{t\to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$

$S_{avg} = \frac{TotalDis\tan ce}{\Delta t}$

$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$

$a = \lim_{t\to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = \frac{d^2x}{dt^2}$

$v = v_0 + a\,t$

$x = x_0 + v_0 t + \frac{1}{2} a\, t^2$

$v^2 - v_0^2 = 2\,a\,(x - x_0)$

$x = \int v dt$

$v = \int a dt$

$A_x = A\cos\theta,$

$A_y = A\sin\theta.$

If $\vec{a} = \vec{b} + \vec{c}$, then

$a_x = b_x + c_x,$

$a_y = b_y + c_y,$

$a_z = b_z + c_z.$

.

$v_x = v_{x0} = v_0\cos\theta_0 = const.$

$x - x_0 = v_0\cos\theta_0 t$

$v_{y0} = v_0\sin\theta_0$

$v_y = v_{y0} - g\,t$

$y = y_0 + v_{y0} t - \frac{1}{2} g\, t^2$

$v_y^2 = v_{y0}^2 - 2\,g\,(y - y_0)$

$t_T = \frac{2v_0\sin\theta_0}{g}$

$R = \frac{v_0^2\sin 2\theta_0}{g}$

$\vec{F}_{net} = m\vec{a}$

$\vec{F}_{12} = -\vec{F}_{21}$

$w = mg$

$f_{s,\max} = \mu_s N$

$f_k = \mu_k N$

$\mu_s > \mu_k$

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

$a = \frac{v^2}{r}$

$T = \frac{2\pi r}{v}$

$F = m\frac{v^2}{r}$

$W = Fd\cos\theta$

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

$W_{net} = K_f - K_i = \Delta K$

$U = PE$

$U_g = mgy$

$U_{elastic} = \frac{1}{2}kx^2$

$E_{mech} \equiv K + U$

$K_f + U_f = K_i + U_i$

$-f_k d = \Delta K + \Delta U$

$\Delta U = U_f - U_i$

$F = -kx$

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

$P = \frac{W}{\Delta t}$

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

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

$$\sum \vec{F}_{ext} = \frac{\Delta \vec{p}_{tot}}{\Delta t}$$

$$\vec{I} = \vec{F}_{avg} \cdot \Delta t = \Delta \vec{p}$$

$$m_1\vec{v}_1 + m_2\vec{v}_2 = m_1\vec{v}_1' + m_2\vec{v}_2'$$

$$\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1v_1'^2 + \frac{1}{2}m_2v_2'^2$$

$$v_1 - v_2 = -(v_1' - v_2')$$

$$x_{CM} = \frac{1}{M}\sum_i m_i x_i$$

$$y_{CM} = \frac{1}{M}\sum_i m_i y_i$$

$$z_{CM} = \frac{1}{M}\sum_i m_i z_i$$

$$M = \sum_i m_i$$

$$\vec{F}_{net} = 0$$

$$\sum_i F_{i,x} = 0$$

$$\sum_i F_{i,y} = 0$$

$$\vec{\tau}_{net} = 0$$

$$\sum_i \tau_{i,x} = 0$$

$$\tau = rF\sin\theta$$

$$\tau = r_\perp F = rF_\perp$$

$$\sum \tau = I\alpha$$

$$\omega = \omega_0 + \alpha t$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$$

$$\omega^2 - \omega_0{}^2 = 2\alpha(\theta - \theta_0)$$

$$s = r\theta$$

$$v = r\omega$$

$$a_t = r\alpha$$

$$I = \sum_i m_i r_i{}^2$$

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

$$L = I\omega$$

$$I_1\omega_1 = I_2\omega_2$$