Prefix	Symbol	Value
yotta	Y	10^{24}
zetta	Z	10^{21}
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
hecto	h	10^{2}
deka	da	10^{1}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}
zepto	z	10^{-21}
yocto	y	10^{-24}

$$\vec{r} = (r, \theta)$$

$$r = |\vec{r}| = \sqrt{r_x^2 + r_y^2}$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

$$r_x = r\cos\theta$$

$$r_y = r\sin\theta$$

$$\hat{r} = \frac{\vec{r}}{|\vec{r}|}$$

$$\vec{r} = r_x\hat{i} + r_y\hat{j}$$

$$a\vec{r} = (ar, \theta)$$

$$\vec{A} + \vec{B} = (A_x + B_x)\hat{i} + (A_y + B_y)\hat{j}$$

$$\vec{A} - \vec{B} = (A_x - B_x)\hat{i} + (A_y - B_y)\hat{j}$$

$$\vec{A}\cdot\vec{B} = AB\cos\theta$$

$$\theta = 0^\circ \iff \vec{A} \parallel \vec{B} \iff \vec{A}\cdot\vec{B} = AB$$

$$\theta = 90^\circ \iff \vec{A} \perp \vec{B} \iff \vec{A}\cdot\vec{B} = 0$$

$$\theta = 180^\circ \iff \vec{A} \parallel \vec{B} \text{ (anti-parallel)} \iff \vec{A}\cdot\vec{B} = -AB$$

$$\int_{x_1}^{x_2} x^n dx = \frac{x^{n+1}}{n+1}\Big|_{x_1}^{x_2} = \frac{x_2^{n+1}}{n+1} - \frac{x_1^{n+1}}{n+1}$$

$$\Delta x = x_f - x_i \qquad \bar{v} = \frac{\Delta\vec{x}}{\Delta t}$$

$$\bar{a} = \frac{\Delta\vec{v}}{\Delta t} \qquad v = \frac{d\vec{x}}{dt}$$

$$v_f = v_i + a\Delta t$$

$$\Delta x = \frac{1}{2}(v_i + v_f)\Delta t$$

$$\Delta x = v_i\Delta t - \frac{1}{2}a\Delta t^2$$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$x = v_{0x}t = v_0 t\cos\theta$$

$$y = v_{0y}t - \frac{1}{2}gt^2 = v_0 t\sin\theta - \frac{1}{2}gt^2$$

$$v_{0x} = v_0\cos\theta$$

$$v_{0y} = v_0\sin\theta$$

$$v_x = v_0\cos\theta$$

$$v_y = v_0\sin\theta - gt$$

$$t_{\text{projectile hits ground}} = \frac{v_0^2}{g}\sin 2\theta$$

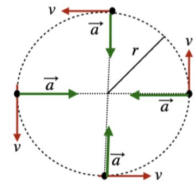
$$v_f = v_i - gt$$

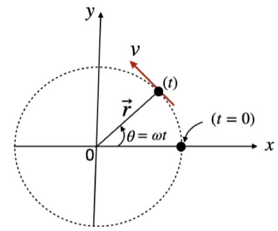
$$y = v_i t - \frac{1}{2}gt^2$$

$$v_f^2 = v_i^2 - 2gh$$

$$t_{\text{object hits ground}} = \sqrt{\frac{2h}{g}}$$

$$\vec{a} = -g\hat{j} \implies a = g$$





$$\vec{a} = -\omega^2\vec{r}$$

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

$$\vec{v} = -\omega r\sin\theta\hat{i} + \omega r\cos\theta\hat{j}$$

$$|\vec{v}| = \omega r$$

$$\vec{r} = r\cos\theta\hat{i} + r\sin\theta\hat{j}$$

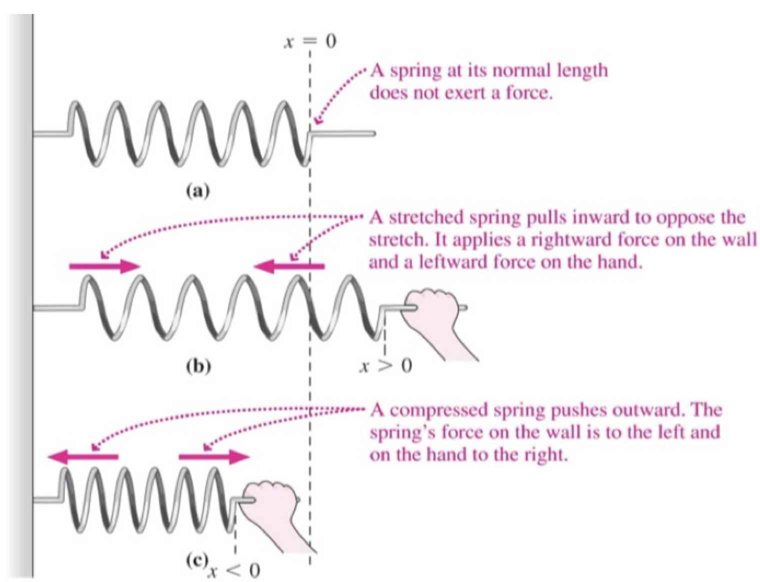
$$\theta = 0 \iff \vec{v} = \omega r\hat{j}$$

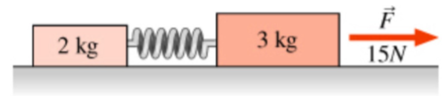
$$\theta = \frac{\pi}{2} \iff \vec{v} = -\omega r\hat{i}$$

$$\vec{F}_{\text{net}} = \frac{mv^2}{r}$$

$$\oint \vec{F}\cdot d\vec{r} = 0 \iff W_{A\to B} + W_{B\to A} = 0$$

$$F_s = -kx \qquad \vec{F}_g = mg$$





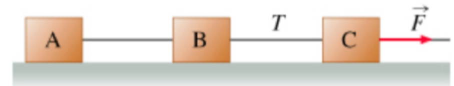
$$\frac{F_s}{m_a} = \frac{F - F_s}{m_b}$$

$$\vec{f}_s \le \mu_s N \qquad \vec{f} = \mu_k\vec{N}$$

$$\vec{N} = mg\cos\theta$$

$$\vec{F}_x = T\cos\theta = Ma$$

$$\vec{F}_y = N + T\sin\theta - Mg = 0$$



$$\vec{F} = \vec{F}_A + \vec{F}_B + \vec{F}_C$$

$$\vec{F} = (m_A + m_B + m_C)a$$

$$\vec{T} = \vec{F} - \vec{F}_B$$

$$F_{\text{Net}} = ma$$

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

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

$$\Delta U_{A\to B} = -\int_A^B \vec{F}\cdot d\vec{r} = -W_{A\to B}$$

$$U_g = mgh$$

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

$$W = \vec{F} \cdot \vec{d} = Fd\cos\theta$$

$$W = \Delta K = W_c + W_{nc}$$

$$W_{\text{Net}} = \sum W$$

$$W_g = -mgh$$

$$W_g = mgh$$

$$W = \int_{x_i}^{x_f} F(x)dx = \int_{x_i}^{x_f} -kxdx = \frac{1}{2}kx_f^2 - \frac{1}{2}kx_i^2$$

$$F(x) = -kx$$

$$W_{nc} = 0 \implies K_1 + U_1 = K_2 + U_2$$

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

$$P = \vec{F} \cdot \vec{v} \text{ (if force is constant)}$$