$$a_y = \frac{d^2y}{dt^2} =$$

$$y(t) = A\cos(\omega t + \phi)$$

$$\frac{d\,f(x)}{dx} = A$$

$$\frac{d\,f(x)}{dx} = 0$$

$$\frac{d\,f(x)}{dx} = f(x)$$

$$\frac{d\,f(x)}{dx} = -f(x)$$

$$\frac{d\,f(x)}{dx} = Af(x)$$

$$\frac{d^2\,f(x)}{dx^2} = 0$$

$$\frac{d^2\,f(x)}{dx^2} = A$$

$$\frac{d^2\,f(x)}{dx^2} = Af(x)$$

$$\frac{d^2\,f(x)}{dx^2} = -Af(x)$$

$$I = I_{\text{com}} + Mx^2$$

$$= \frac{1}{12}ML^2 + Mx^2$$

$$\tau = Mgx\sin(\theta)$$

$$\alpha = \frac{\tau}{I_{\text{tot}}}$$

$$= \left(\frac{Mgx}{\frac{1}{12}ML^2 + Mx^2}\right)\sin(\theta)$$

$$\vec{\alpha} \simeq -\left(\frac{Mgx}{\frac{1}{12}ML^2 + Mx^2}\right)\vec{\theta}$$

$$\sin(\theta) \simeq \theta \qquad \text{in radians}$$

$$\alpha = \frac{d^2\theta}{dt^2}$$

$$\frac{d^2\theta}{dt^2} \simeq -\left(\frac{Mgx}{\frac{1}{12}ML^2 + Mx^2}\right)\theta$$