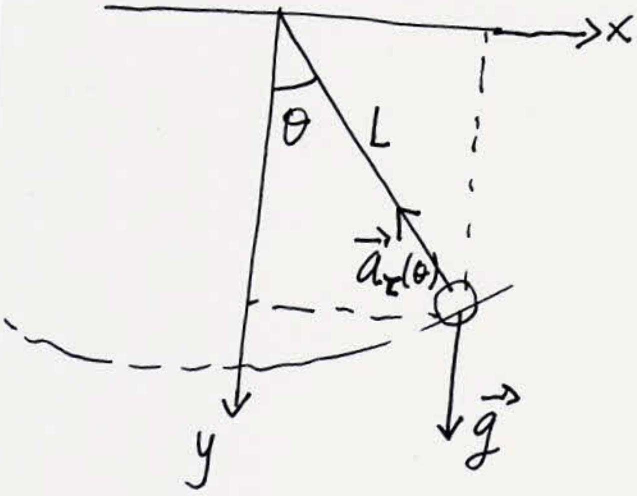
COMPLEMENTO - I

EL PENDULO SIMPLE EN CINEMATICA



Hay dos aceleraciones $\vec{g}$ y $\vec{a}_\tau(\theta)$

$$x = L \operatorname{sen}\theta$$

$$y = L\cos\theta$$

$$\dot{x} = L\dot{\theta}\cos\theta \Rightarrow \ddot{x} = L\ddot{\theta}\cos\theta - L\dot{\theta}^2 \operatorname{sen}\theta$$

$$\dot{y} = -L\dot{\theta}\operatorname{sen}\theta \Rightarrow \ddot{y} = -L\ddot{\theta}\operatorname{sen}\theta - L\dot{\theta}^2\cos\theta$$

$$\ddot{x} = -a_\tau(\theta)\operatorname{sen}\theta = L\ddot{\theta}\cos\theta - L\dot{\theta}^2\operatorname{sen}\theta \quad (\times \cos\theta)$$

$$\ddot{y} = g - a_\tau(\theta)\cos\theta = -L\ddot{\theta}\operatorname{sen}\theta - L\dot{\theta}^2\cos\theta. \quad (\times \operatorname{sen}\theta)$$

Se reduce a $\quad -g\operatorname{sen}\theta = L\ddot{\theta} \Rightarrow \boxed{\ddot{\theta} + \frac{g}{L}\operatorname{sen}\theta = 0}$

Para pequeñas oscilaciones : $\operatorname{sen}\theta \simeq \theta$. y resulta la ec. de un MAS.

$$\left.\begin{array}{l} \ddot{\theta} + \frac{g}{L}\theta = 0 \\ \theta(0) = \theta_0 \\ \dot{\theta}(0) = \omega_0 \end{array}\right] \quad \omega^2 = \frac{g}{L} \Rightarrow \theta(t) = \theta_0 \cos \omega t \quad (\text{si } \omega_0 = 0)$$

PERÍODO : $T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{L}{g}}$