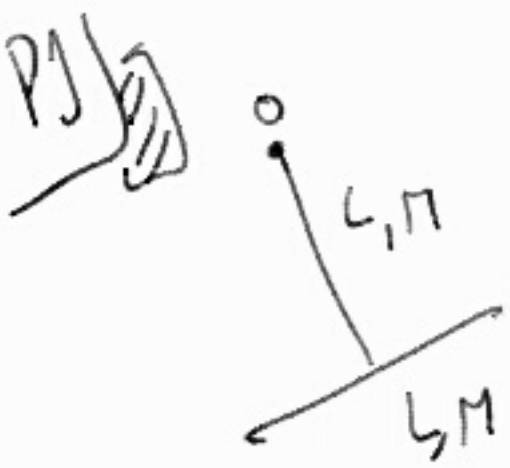


$$\star\ I_o = \underbrace{\frac{1}{3}ML^2}_{\text{varillaenum extremo}} + \underbrace{\frac{1}{12}ML^2}_{\text{cjc centro}} + \underbrace{ML^2}_{\text{steiner}}$$

$$I_o = \frac{17}{12}ML^2$$

$$\star\ CM = \frac{\frac{L}{2}M + L\cdot M}{2M} = \frac{3}{4}L$$

$$\boxed{\Sigma \tau_o = I_o \alpha}$$

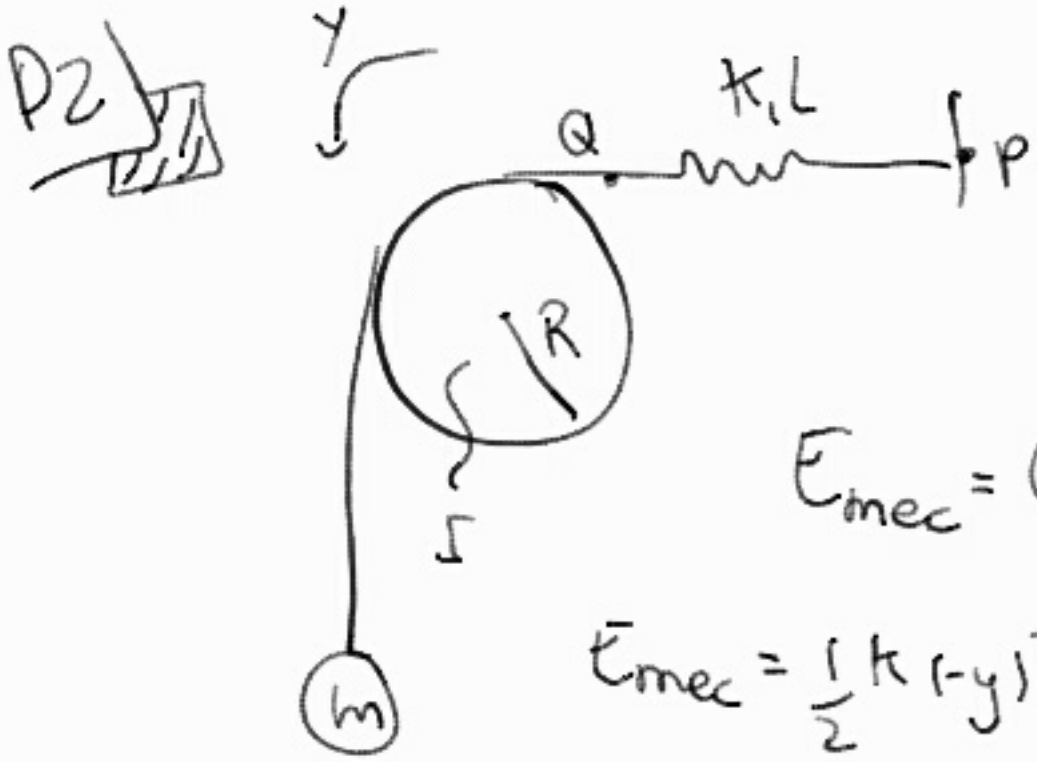
$$2Mg\,\text{sen}\theta \cdot CM = I_o \alpha$$

arreglando y $\text{sen}\theta \approx \theta$

$$2Mg\,\text{sen}\theta\ \frac{3}{4}L = \frac{17}{12}ML^2\ddot{\theta}$$

$$\ddot{\theta} - \frac{18}{17}\frac{g}{L}\theta = 0$$

$$\omega_o^2 = \frac{g}{L}\frac{18}{17}$$



$$E_{mec} = E_{elast} + E_{Ft} + E_g$$

$$E_{mec} = \frac{1}{2} k (-y)^2 + K_{polea} + K_{masa} + mgy$$

$$\frac{1}{2} I \dot{\theta}^2 + \frac{1}{2} m \dot{y}^2$$

$$E_{mec} = \frac{1}{2} k y^2 + \frac{1}{2} I \dot{\theta}^2 + \frac{1}{2} m \dot{y}^2 + mgy = cte$$

$V = \omega R$

$$\frac{1}{2} k y^2 + \frac{1}{2} I \frac{\dot{y}^2}{R^2} + \frac{1}{2} m \dot{y}^2 + mgy = cte$$

$\dot{y} = \dot{\theta} R$

$\dot{\theta} = \frac{\dot{y}}{R}$

$$\frac{dE_m}{dt} = 0$$

$$k y \dot{y} + \frac{I}{R^2} \dot{y} \ddot{y} + m \dot{y} \ddot{y} + mg \dot{y} = 0$$

$$k y + \frac{I}{R^2} \ddot{y} + m \ddot{y} + mg = 0$$

$$\ddot{y} \left(\frac{I}{R^2} + m \right) + k y + mg = 0$$

$$\ddot{y} + \frac{k}{\left(\frac{I}{R^2} + m \right)} y + \frac{mg}{\left(\frac{I}{R^2} + m \right)} = 0$$

$$\ddot{y} + \frac{k}{\left(\frac{I}{R^2} + m\right)} \left(y + \frac{mg}{k} \right) = 0$$

CV: $z = y + \frac{mg}{k}$ $\quad \ddot{z} = \ddot{y}$

$$\ddot{z} + \frac{k}{\left(\frac{I}{R^2} + m\right)} z = 0$$

$$\omega_0^2 = \frac{k}{\frac{I}{R^2} + m}$$

P3)

$V_0 = 20\ cm/s$

$A = 0.05\ m$

$x = A\sin(\omega T + \varphi_0)$

$V = \frac{dx}{dt} = A\omega\cos(\omega T + \varphi_0) \rightarrow V_{max} \rightarrow \cos = 1$

$x_0 \rightarrow V_{máx} : \cos(\omega \cdot 0 + \varphi_0) = 1 \rightarrow \varphi_0 = 0\ Rad$

$V_{max} = A\omega = 0,2\ m/s \rightarrow \omega = \frac{V_{max}}{A} = \frac{0,2}{0,05} = 4\ Rad/s$ Frecuencia

$T = \frac{2\pi}{\omega} \quad t = \frac{2\pi}{4} = \frac{\pi}{2}\ seg$

elongación, V, $\vec{a}$ y 1.75π

$x = A\sin(\omega t + \varphi_0)$

$x(t) = 0.05\sin(4t)$

$x(1.75\pi) = 0.05\sin(4 \cdot 1.75\pi) = 0$

$\frac{1.75 \cdot 4}{7,00}$

7π

$V = \frac{dx}{dt} = 0,2\cos(4t)$

$V(1.75\pi) = 0.2\cos(4 \cdot 1.75\pi) = -0,2\ m/s$

$a = \frac{dV}{dt} = -0,8\sin(4t)$

$a(1.75\pi) = -0.8\sin(4 \cdot 1.75\pi) = 0\ m/s^2$

→ Diferencia de fase

$$\omega t_{1.75\pi} - \omega t_0 = \Delta\varphi$$

$$4 \cdot 1.75\pi - 0 = \Delta\varphi$$

7π rad es la diferencia de fase .

Pasdf) Gráfico

veremos que $\frac{T}{2} = 0{,}2\,seg \rightarrow T = 0.4\,seg$ ← gráfico

$$\omega = \frac{2\pi}{T} = 5\pi\ rad$$

$\vec{a}_{máx} = 300\ cm/seg^2$ (Del gráfico)

$\vec{a}_{máx} = A\omega^2$ (ver pregunta anterior para entender)

$$A = \frac{300\ cm/seg^2}{5\pi\ 1/seg^2} = 1{,}216\ cm$$

CI $a(0) = 0$ (ver gráfico)

$$-A\omega^2 \sin(\omega T + \varphi_0) = 0$$

$$\sin(\omega T + \varphi_0) = 0$$

$$\sin(\omega t + \varphi_0) = 0$$

$$\sin(0 + \varphi_0) = 0$$

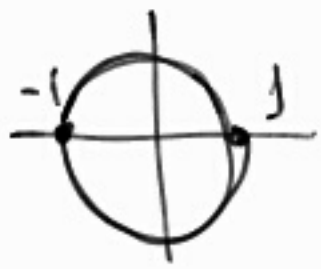
$$\sin \varphi_0 = 0 \rightarrow \varphi_0 \text{ es } 0 \text{ o } \pi ?$$

- en el tiempo 0.2 la velocidad es máx
  - $\cos(\omega t + \varphi_0) = 1$ (Pues es máx)

$$\cos(5\pi \cdot 0.2 + \varphi_0) = 1 \qquad 5 \cdot 0{,}2$$

$$\cos(\pi + \varphi_0) = 1$$

$\varphi_0 = \pi$ para que el cos sea máx (= 1)



$\therefore$

$$x = A(\omega t + \varphi_0)$$

$$x = 1{,}216 \sin(5\pi t + \pi) \text{ cm}$$