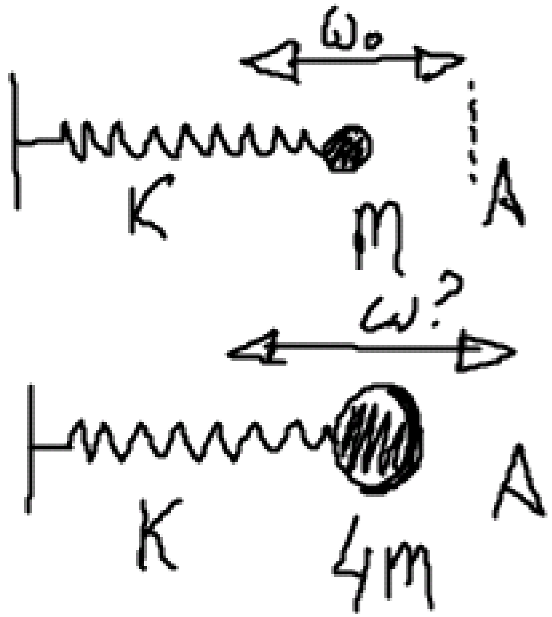
1-



a) $\vec{F} = -Kx\hat{i} = ma\hat{i}$

$$-Kx = -m\omega^2 x$$

$$\boxed{K = m\omega^2}$$

$$\boxed{\omega_0 = \sqrt{K/m}}$$

$$\boxed{\omega = \sqrt{K/4m} = \frac{1}{2}\sqrt{K/m} = \frac{\omega_0}{2}}$$

SI SE CUADRIPLICA LA MASA, MANTENIENDO K, LA FRECUENCIA SE HACE LA MITAD.

b) • $E_m = E_c + E_p = \frac{1}{2}KA^2$ (*) $\Rightarrow \boxed{E_{p_{máx}} = \frac{1}{2}KA^2}$

AL NO CAMBIAR K NI A, $E_{p_{máx}}$ NO CAMBIA.

• $\boxed{V_{máx_0} = A\omega_0}$ (*) $\Rightarrow V_{máx} = A\omega = A\frac{\omega_0}{2} = \frac{V_{máx_0}}{2}$

LA VELOC. MÁXIMA DE OSCILACIÓN SE REDUCE A LA MITAD

$$\boxed{V_{máx} = \frac{V_{max_0}}{2}}$$

- $$\boxed{T_0 = \frac{1}{f_0} = \frac{2\pi}{\omega_0}} \Rightarrow \boxed{T = \frac{2\pi}{\omega} = \frac{2\pi}{\omega_0/2} = 2T_0}$$

AL SER INVERSAMENTE PROPORCIONAL A ω; EL PERIODO
<u>SE DUPLICA</u>.

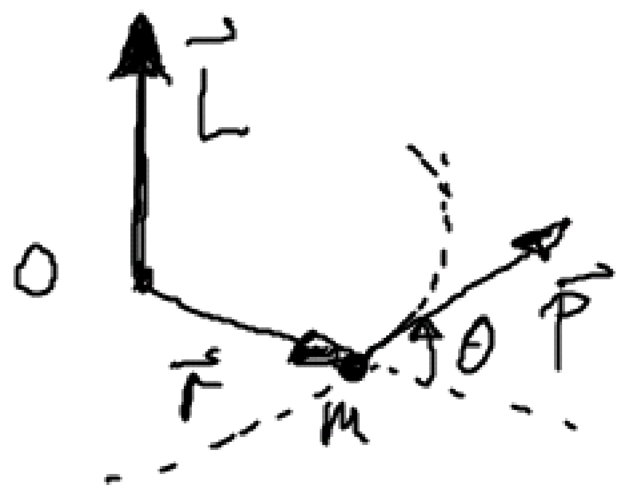
- $$\boxed{E_m = \frac{1}{2}KA^2}$$

NO DEPENDE DE ω;
<u>SE MANTIENE CTE.</u>

2-

$$\boxed{\vec{L} = \vec{r} \times \vec{p}}$$

EL MOM. CINÉTICO O ANGULAR DE UNA PARTÍCULA RESPECTO A UN PUNTO O ES EL PRODUCTO VECT. DE SU POSICIÓN $\vec{r}$, RESPECTO A DICHO PUNTO POR SU CANTIDAD DE MOVIMIENTO ($\vec{p}$).



$$[\vec{L}] = M L^{2} T^{-1} \quad (Kg \cdot m^{2} \cdot s^{-1})$$

$$\boxed{\vec{p} = m\vec{v}} \quad [\vec{p}] = M L T^{-1}$$

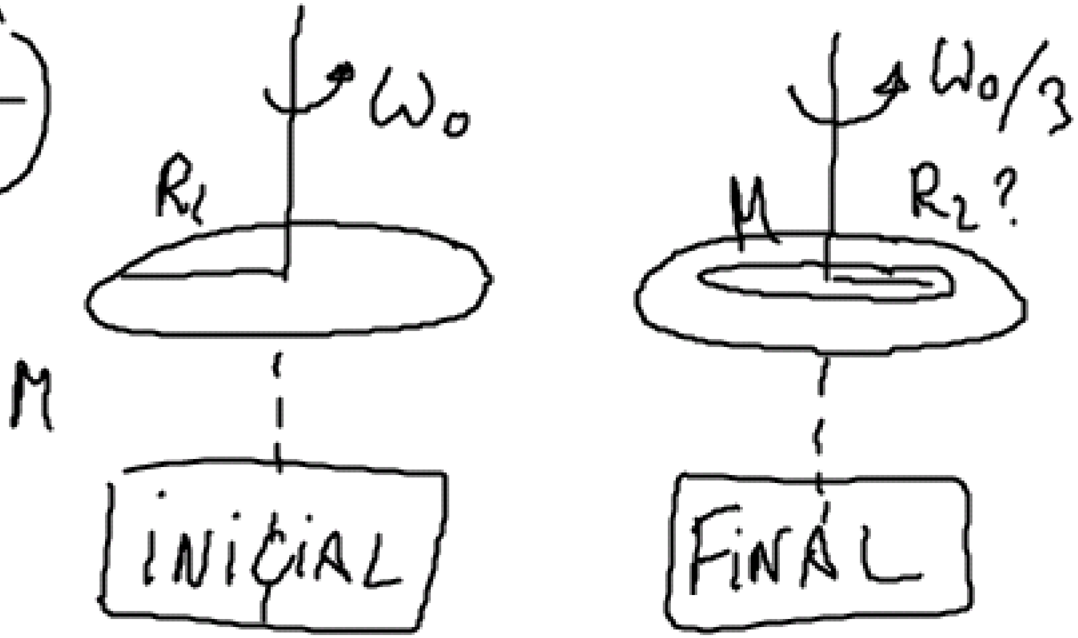
T^a Mom. Cinético $\boxed{\dfrac{d\vec{L}}{dt} = \vec{M}}$ Si $\vec{M} = \vec{0} \Rightarrow \boxed{\vec{L} = cte}$

$\vec{M} = \vec{r} \times \vec{F}$ se anula si:

$M = rF\operatorname{sen}\theta$

- $\vec{r} = \vec{0}$ (LA FUERZA SE APLICA SOBRE EL PUNTO O)
- $\vec{F} = \vec{0}$ (NO HAY FUERZA)
- $\operatorname{sen}\theta = 0$ ($\vec{r} \parallel \vec{F}$)

3-



a) $\boxed{\vec{L}_0 = \vec{L}_f}$

$\boxed{L = I\,\omega}$

$I_1 \cdot \omega_0 = (I_1 + I_2) \cdot \omega_0/3$

$I_1 = \frac{1}{2} M R_1^2$

$I_2 = \frac{1}{2} M R_2^2$

$\cancel{\frac{1}{2}} \cancel{M} R_1^2 \cdot \cancel{\omega_0} = \cancel{\frac{1}{2}} \cancel{M} (R_1^2 + R_2^2) \cdot \frac{\cancel{\omega_0}}{3}$

$\frac{R_1^2 + R_2^2}{R_1^2} = 3 \Rightarrow 1 + \frac{R_2^2}{R_1^2} = 3$

$R_2^2 = 2 R_1^2 \Rightarrow \boxed{R_2 = \sqrt{2}\, R_1}$

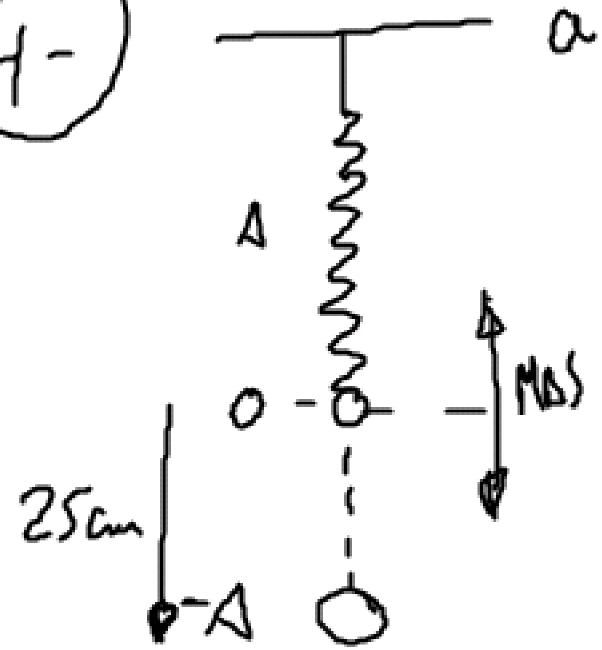
b) Si $\boxed{R_1 = \sqrt{2}\ R_2}$ $\Rightarrow$ $I_1 \cdot \omega_0 = (I_1 + I_2) \cdot \omega_f$

$$\cancel{\tfrac{1}{2}M} R_1^2 \cdot \omega_0 = \cancel{\tfrac{1}{2}M} \left(R_1^2 + R_2^2\right) \cdot \omega_f$$

$$\Rightarrow (\sqrt{2} R_2)^2 \omega_0 = \Big[\underbrace{(\sqrt{2} R_2)^2 + R_2^2}_{3R_2^2}\Big] \omega_f$$

$$\boxed{\omega_f = \frac{2}{3}\omega_0} \leftarrow \omega_f = \frac{2\cancel{R_2^2}}{3\cancel{R_2^2}}\omega_0$$

4-



$m = 3\ \text{Kg}$

$T = 1\ \text{s}$

$A = 25\ \text{cm}$

a) $y(t) = A\,\text{sen}\,(\omega t + \varphi_0)$

$y(0) = A\,\text{sen}\,\varphi_0 = -A$

$\text{sen}\,\varphi_0 = -1 \Rightarrow \boxed{\varphi_0 = \frac{3\pi}{2}\ \text{rad}}$

$\omega = \frac{2\pi}{T} = \boxed{2\pi\ \text{rad/s}}$

$$\boxed{y(t) = 0{,}25\,\text{sen}\,(2\pi t + 3\pi/2)\ \text{m}}$$

$V = \frac{dy}{dt} = \boxed{A\omega}\cos(\omega t + \varphi_0)$

$\boxed{V_{máx} = 1{,}57\ \text{m/s}}$ (en $y=0$)

b) $$\begin{cases} E_m = \frac{1}{2}KA^2 = E_c + E_p \\ E_c = E_p \end{cases}$$

$$\frac{1}{2}KA^2 = 2E_p$$

$$\cancel{\frac{1}{2}}\cancel{K}A^2 = 2\cdot\cancel{\frac{1}{2}}\cancel{K}x^2$$

$$x = \pm\sqrt{1/2}\cdot A = \boxed{\pm 0{,}18\,m}$$

5- $\vec{r}(t) = (3, 2t^3 - 4t, -2t - 3)$ m

a) $W = \int \vec{F} \cdot d\vec{r} = \int_0^3 \vec{F} \cdot \vec{v} \cdot dt = \boxed{2{,}48 \cdot 10^6 \text{ J}}$

$\vec{v} = \frac{d\vec{r}}{dt} \rightarrow \boxed{d\vec{r} = \vec{v} \cdot dt}$

b) $\vec{L}' = \vec{r}' \times \vec{p} = \boxed{16000\, t^3\, \hat{i} \ \ \text{Kg} \cdot \text{m}^2 \cdot \text{s}^{-1}}$

$\vec{r}' = \vec{r} - (3, 0, -3) = (0, 2t^3 - 4t, -2t)$ m

c) $\vec{M} = \frac{d\vec{L}}{dt} = \boxed{48000\, t^2\, \hat{i}\ N \cdot m}$ $\vec{L}$ no se conserva

d) $E_c = \frac{1}{2} m v^2 = \boxed{(36000\, t^4 - 48000\, t^2 + 20000)\ J}$

$v(t) = \sqrt{(6t^2-4)^2 + (-2)^2} = \sqrt{36t^4 - 48t^2 + 20}$

¡No es constante!