Pauta P2 - C2

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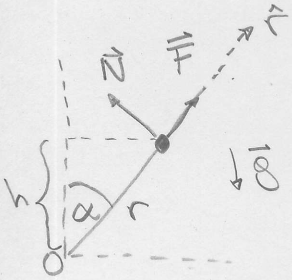
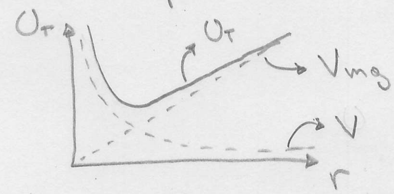



$\vec{F} = \frac{K}{r^2}\hat{r}$ a) Se busca V tal que: $-\vec{\nabla} V = \vec{F}$

$$\Rightarrow -\frac{\partial V}{\partial r}\hat{r} = \frac{K}{r^2}\hat{r} \iff \boxed{V = \frac{K}{r}}$$

$$\Rightarrow U_T = \frac{K}{r} + mgh = \frac{K}{r} + mg\cos\alpha\, r$$




No existe la negativa

b) $$\frac{\partial U}{\partial r} = -\frac{K}{r^2} + mg\cos\alpha \Rightarrow \left.\frac{\partial U}{\partial r}\right|_{r_*} = 0$$

$$\frac{K}{r_*^2} = mg\cos\alpha \iff \boxed{r_* = +\sqrt{\frac{K}{mg\cos\alpha}}} \quad (1)$$

$$\frac{\partial^2 U}{\partial r^2} = 3\frac{K}{r^3} \Rightarrow \frac{\partial^2 U}{\partial r^2} = \frac{3K}{r_*^3} = 3K\left(\frac{mg\cos\alpha}{K}\right)^{3/2} > 0 \Rightarrow \text{estable}$$

$$\omega_{po} = \sqrt{\frac{1}{m}\left.\frac{\partial U}{\partial r}\right|_{r_*}}$$

c) Solo fuerzas conservativas:

$$\cancel{K_i}^{\,0} + U_i = \cancel{K_f}^{\,0} + U_f$$

$$\frac{K}{r_0} + mg\cos\alpha\, r_0 = \frac{2K}{r_0} + mg\cos\alpha\frac{r_0}{2}$$

$$\Rightarrow \boxed{r_0 = +\sqrt{\frac{2K}{mg\cos\alpha}}}$$

d) Se cumple que $\boxed{N \equiv mg\,\text{sen}\,\alpha} \Rightarrow \boxed{\vec{f}_r = \mu mg\,\text{sen}\,\alpha\hat{r}}$ (Viene de vuelta)

$$E_f - E_i = \int_{r_0}^{\frac{3r_0}{4}} \vec{f}_r \cdot d\vec{r}$$

$$\Rightarrow \frac{4}{3}K\frac{1}{r_0} + mg\cos\alpha\frac{3}{4}r_0 - \frac{K}{r_0} - mg\cos\alpha\, r_0 = -\frac{1}{4}\mu mg\,\text{sen}\,\alpha\, r_0$$

$$\frac{1}{3}\frac{K}{r_0} - \frac{1}{4}mg\cos\alpha\, r_0 = -\frac{1}{4}\mu mg\,\text{sen}\,\alpha\, r_0$$

$$\Rightarrow \boxed{\mu = \frac{\frac{1}{4}mg\cos\alpha\, r_0 - \frac{1}{3}\frac{K}{r_0}}{\frac{1}{4}mg\,\text{sen}\,\alpha\, r_0}}$$