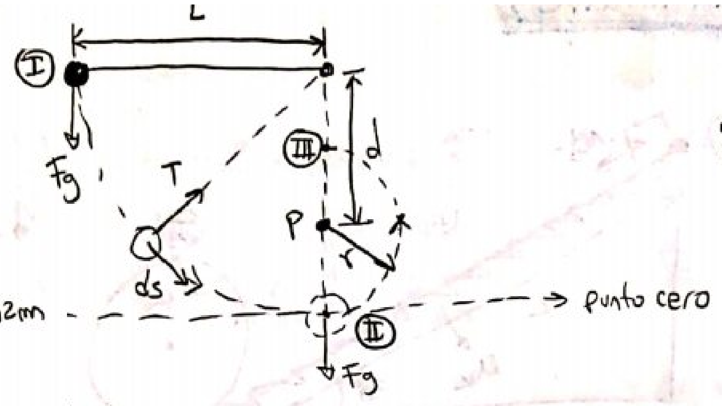
(c) (Pb)



$g = 9{,}8 \frac{m}{s^2}$

$L = 120\ cm \sim 1{,}2m$

$d = 75\ cm$

→ Calcular velocidades

(a) Punto mas bajo de su movimiento

→ la Tension no realiza trabajo

→ Solo fuerzas conservativas → F_g

$$E_I = E_{II}$$

$$mgL = \frac{1}{2} m v_{II}^2 \rightarrow v_{II} = \sqrt{2gL} = 4{,}849 \frac{m}{s}$$

(b)

$$E_{II} = E_{III}$$

$$\frac{1}{2} \cancel{m} v_{II}^2 = \cancel{m} g(2r) + \frac{1}{2} \cancel{m} v_{III}^2$$

$$v_{II}^2 = 4gr + v_{III}^2 \rightarrow v_{III} = \sqrt{v_{II}^2 - 4gr}$$

$$= \sqrt{2gL - 4gr} = \sqrt{2g(L-2r)}$$

$$r = L - d = 1{,}2m - 0{,}75m = 0{,}45m \qquad = 2{,}42 \frac{m}{s}$$

(c)

Si la bola debe moverse en mov. circular alrededor de P entonces existe tension en III

$$\text{en III} \rightarrow \quad F_g + T = m a_c = m \frac{v_{III}^2}{r}$$

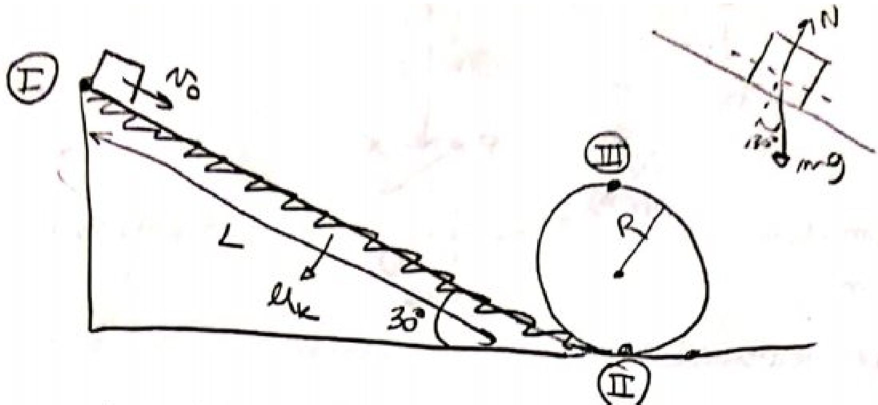
Para que no caiga $T > 0$ $\quad T = \underbrace{m \frac{v_{III}^2}{r} - mg > 0}_{v_{III}^2 > gr}$

Por (b) $\quad 2\cancel{g}(L-2r) > \cancel{g} r \quad$ y con que $r = L - d$

$$2L - 4L + 4d > L - d$$

$$5d > 3L \rightarrow \boxed{d > \frac{3L}{5}}$$

P6 12



$L = 1\,m$

$v_0 = 1\ m/s$

$R = L/6$

→ Calcular maximo valor del coeficiente de friccion para que el bloque pueda completar el rizo?

I – II

$$\frac{1}{2}\cancel{m}v_{II}^2 - \frac{1}{2}\cancel{m}v_0^2 + (0 - \cancel{m}g.L.\operatorname{sen}(30°)) = -\mu_k \cancel{m}.g\cos(30°).L$$

$$v_{II}^2 = -2\mu_k g.\cos(30°)L + v_0^2 + 2gL\operatorname{sen}(30°)$$

II – III

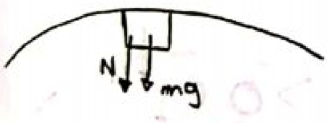
$$\frac{1}{2}\cancel{m}v_{III}^2 - \frac{1}{2}\cancel{m}v_{II}^2 + 2\cancel{m}gR = 0$$

$$v_{III}^2 = -4gR + v_{II}^2$$

(*)
$$v_{III}^2 = -4gR - 2\mu_k g\cos(30°)L + v_0^2 + 2gL\operatorname{sen}(30°)$$

$$v_{III}^2 = -2g\frac{L}{3} - 2\mu_k gL\cos(30°) + v_0^2 + 2gL\operatorname{sen}(30°)$$

$$v_{III}^2 = -2gL\left(\frac{1}{3} + \mu_k\cos(30°) - \operatorname{sen}(30°)\right) + v_0^2$$



$N + mg = m a_c$

$N = m a_c - mg$

con $N \geq 0$

$m a_c \geq mg$

$m.\frac{v_{III}^2}{R} \geq mg$

$$mg \leq m.\frac{v_{III}^2}{R} \rightarrow v_{III}^2 \geq gR = g\frac{L}{6}$$

$$g\frac{L}{6} \leq -2gL\left(\frac{1}{3} - \operatorname{sen}(30°)\right) - 2gL\cos(30°)\mu_k + v_0^2$$

$$\mu_k \leq \frac{-2gL\left(\frac{1}{3} - \operatorname{sen}(30°)\right) - g\frac{L}{6} + v_0^2}{2gL\cos(30°)} = \frac{+3{,}26 + 9{,}8 - 1{,}6 + 1}{16{,}97}$$

$\mu_k \leq 0{,}73$

P6

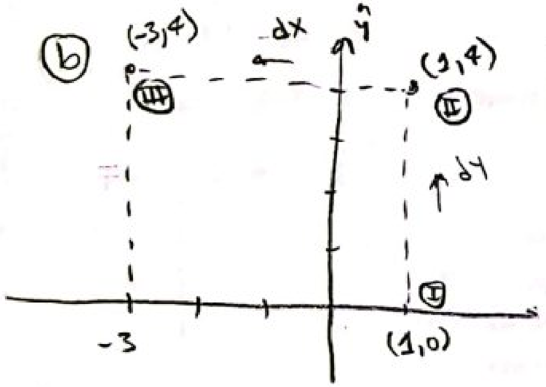
15 $\vec{F}(x,y) = (2xy+3y)\hat{i} + (x^2+3x)\hat{j}$

a

$$F = -\nabla U = -\left(\frac{\partial U}{\partial x}\hat{i} + \frac{\partial U}{\partial y}\hat{j}\right) \qquad \begin{cases} -\dfrac{\partial U}{\partial x} = 2xy+3y \\ -\dfrac{\partial U}{\partial y} = x^2+3x \end{cases}$$

$\boxed{U = -yx^2 - 3yx}$ → proviene de un potencial

b



$$\boxed{\begin{array}{l}\text{Calculo trabajo} \\ W = \int \bar{F}\cdot\bar{ds}\end{array}}$$

en I-II $= \displaystyle\int_0^4 (x^2+3x)\,dy \overset{x=1}{=} x^2y+3xy\Big|_0^4$

$= 1^2\cdot 4 + 3\cdot 1\cdot 4 = 16$

en II-III $\overset{y=4}{=} \displaystyle\int_1^{-3} 2xy+3y\,dx = x^2y+3yx\Big|_1^{-3} =$

$= [(-3)^2 4 + 3\cdot 4\cdot(-3)] - (4+3\cdot 4\cdot 1)$

$= -16$

$W_{Total} = 16-16 = 0$

~~I-II $W = \Delta U = -1^2\cdot 4 - 3\cdot 4\cdot 1 = -16$~~

~~II-III $W = \Delta U = (-4\cdot(-3)^2 - 3\cdot 4\cdot(-3)) - (-4-3\cdot 4) = 16$~~

~~$W_{Total} = 16-16 = 0$~~