1) $\frac{y'}{y} = 0{,}2 \qquad -\frac{x'}{x} = 0{,}2 \qquad -x' = 0{,}2x$

$x - x' = 21\,cm$

$x + 0{,}2x = 21\,cm$

$1{,}2x = 21\,cm$

$\boxed{x = 17{,}5\,cm}$

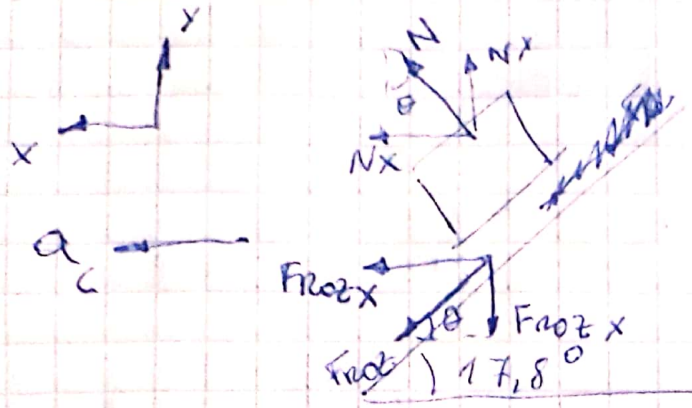
$\frac{1}{f} = \frac{1}{x} + \frac{1}{x'}$

$\frac{1}{f} = \frac{1}{17{,}5} - \frac{1}{0{,}2 \cdot 17{,}5}$

$\frac{1}{f} = \frac{1 - 5}{17{,}5}$

$\frac{1}{f} = -\frac{4}{17{,}5} \rightarrow \boxed{f = -4{,}375\,cm}$

2)



$N_x = -F_{roz\,x}$

$N \cdot \operatorname{sen}\theta = -F \cdot \cos\theta$

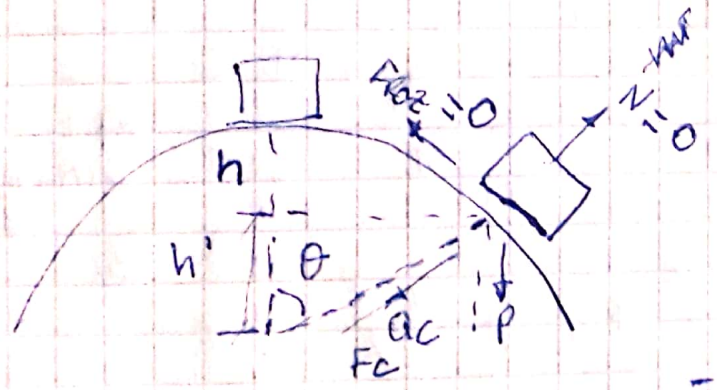
$N \operatorname{sen}\theta = -N \cdot \mu_e \cos\theta$

$-\frac{\operatorname{sen}\theta}{\cos\theta} = \mu_e$

$\mu_e = 0,321$

Froz evitido contracio

3)



$h' = \cos\theta \cdot R$

$h = R - \cos\theta \cdot R$

$\Delta E_m = 0 - F_{roz} \cdot \Delta x$

$E_{pi} = m \cdot g \cdot h$

$E_{mf} = \frac{1}{2} m \cdot v_f^2$

$a_c = \frac{v_f^2}{R}$

$-m \cdot g \cdot h + \frac{1}{2} m\, a_c\, R = W$

$= m \cdot g \cdot h + \frac{1}{2} m\, g \cos\theta\, R = -F_{roz}\, \Delta x$

$-14,49\,j = W_{Froz}$

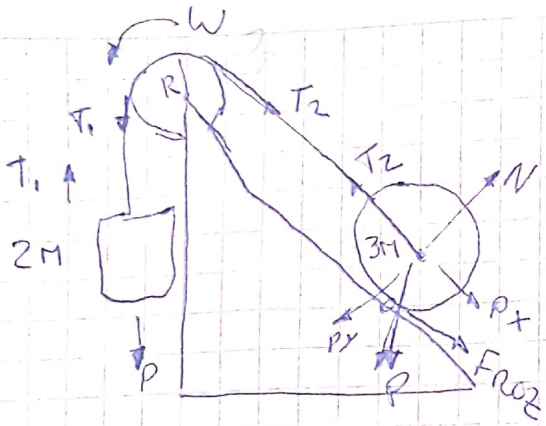
$\Sigma F_y = F_c = P_y$

$m \cdot a_c = m \cdot g \cos\theta$

$a_c = g \cos\theta$

NOTA

4)



Polea:

$$\Sigma \tau = T_1 \cdot R - T_2 R = I_{cm} \cdot \frac{a_T}{R} \quad (I)$$

BLOQUE

$$P - T_1 = m \cdot a_T$$
$$2Mg - 2M \cdot a_T = T_1$$

cilindro:

$$\Sigma \tau_o = T_2 \cdot 2R - P \operatorname{sen}\theta \cdot 2R = \left(\frac{1}{2} M (2R)^2 + M(2R)^2\right) \frac{a_T}{2R}$$

$$T_2 = \frac{18 M R^2 \frac{a_T}{2R} + P \operatorname{sen}\theta \, 2R}{2R}$$

$$T_2 = 18 M \frac{a_T}{4} + P \operatorname{sen}\theta$$

Reemplazando en (I)

$$(2Mg - 2M a_T - 18M \frac{a_T}{4} - P \operatorname{sen}\theta) R = \frac{1}{2} M R^2 \frac{a_T}{R}$$

$$2Mg - 2M a_T - 18M \frac{a_T}{4} - 3M \cdot g \operatorname{sen}\theta = \frac{1}{2} M a_T$$

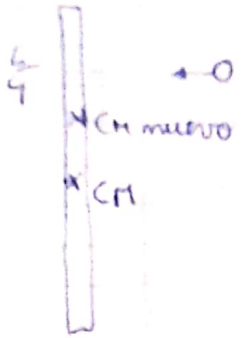
$$2g - 2a_T - 18 \frac{a_T}{4} - 3g \operatorname{sen}\theta = \frac{1}{2} a_T$$

$$-6{,}73 = \frac{1}{2} a_T + 2 a_T + 18 \frac{a_T}{4}$$

$$-6{,}73 = 7 a_T$$

$$\boxed{a_T = -0{,}961 \ m/s^2} \qquad |a_T| = 0{,}961 \ m/s^2$$

5)



$\Delta P = 0$

$\frac{M}{2} v_i = \left(M + \frac{M}{2}\right) v_f$

$\frac{M}{2} v_i = \frac{3M}{2} v_f$

$\boxed{v_i = 3 v_f}$

$\boxed{v_f = \frac{v_i}{3}}$ en el CM nuevo del sistema.

$y_{CM}\left(\frac{M}{2} + M\right) = \frac{M}{2} \cdot \frac{L}{4} + M \cdot 0$

$y_{CM} \frac{3}{2} M = \frac{ML}{8}$

$y_{CM} = \frac{2L}{24}$ $\boxed{y_{CM\,nuevo} = \frac{1}{12} L}$

$\Delta L = 0 \rightarrow$ $\frac{M}{2} v_i \cdot \frac{L}{4} = \left[\frac{1}{12} ML^2 + M\left(\frac{1}{12} L\right)^2 + \frac{M}{2}\left(\frac{L}{4} - \frac{L}{12}\right)^2\right] \omega$

$\frac{ML}{8} v_i = \left[\frac{13}{144} ML^2 + \frac{1}{72} ML^2\right] \omega$

$\frac{ML}{8} v_i = \frac{5}{48} ML^2 \omega$

$\frac{v_i}{8} = \frac{5}{48} L \omega$

$\frac{60}{5} \frac{v_i}{L} = \omega$

$V_B = \omega \cdot \left(\frac{L}{2} + \frac{1}{12} L\right) \rightarrow$ $V_B = \frac{60}{5} \frac{v_i}{L} \cdot \frac{7}{12} L$ $\boxed{V_B = \frac{17,5}{10} v_i}$

$\boxed{V_B = 0,7 v_i}$

6)

$Q = cte$ $v_1 \cdot A_1 = v_2 A_2$

$0,18\ m \cdot \pi \cdot (0,07)^2 = v_2 \cdot \pi (0,02)^2$

$\boxed{v_2 = 2,205\ m/s}$

$P_1 + \frac{1}{2} \rho_1 (v_1)^2 = P_2 + \frac{1}{2} \rho (v_2)^2$

$P_1 - P_2 = \frac{1}{2} \rho (v_2)^2 - \frac{1}{2} \rho (v_1)^2$

$\Delta P = 1931,85\ Pa$

$\boxed{\Delta P = 1,93185\ kPa}$