EJERCICIO 1 (TOTAL 25%)

1a) $\vec{v} = \frac{d\bar{r}}{dt} = \left(1\frac{m}{s^4}t^3 - 2\frac{m}{s^2}t + 4\frac{m}{s}\right)\check{i} + \left(2\frac{m}{s^2}t - 6\frac{m}{s}\right)\check{j}$

$\vec{a} = \frac{d\vec{v}}{dt} = \left(3\frac{m}{s^4}t^2 - 2\frac{m}{s^2}\right)\check{i} + 2\frac{m}{s^2}\check{j}$

1b) $\vec{v}(1s) = 3\frac{m}{s}\check{i} - 4\frac{m}{s}\check{j} \Rightarrow |\bar{v}| = 5 m/s$

$\vec{a}(1s) = 1\frac{m}{s^2}\check{i} + 2\frac{m}{s^2}\check{j}$

$a_t = \frac{\bar{v}\cdot\bar{a}}{|\bar{v}|} = \frac{3\,m^2/s^3 - 8\,m^2/s^3}{5\,m/s} = -1\frac{m}{s^2}$

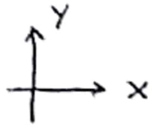
$a_n = \frac{|\bar{v}\times\bar{a}|}{|\bar{v}|} = \frac{|(6\,m^2/s^3 + 4\,m^2/s^3)\check{k}|}{5\,m/s} = 2\frac{m}{s^2}$

$\vec{a}(1s) = -1\frac{m}{s^2}\check{t} + 2\frac{m}{s^2}\check{n}$

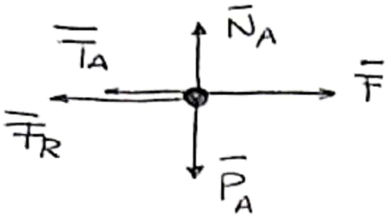
1c) Frena porque la componente tangencial de la aceleración $a_t = \frac{d|\bar{v}|}{dt} < 0$

EJERCICIO 2 (TOTAL 35 %)

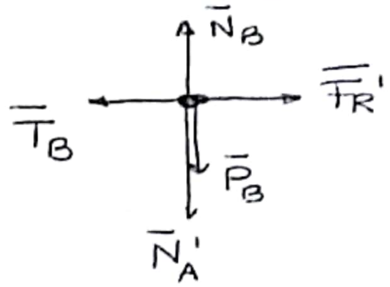
2a) SC



DCL M_A



DCL M_B



Ecuaciones de movimiento

$\rightarrow \sum \bar{F}_A = M_A \bar{a}_A \rightarrow$ x) $F - T_A - F_R = M_A a_{Ax}$

y) $N_A - P_A = 0$

$\left(N_A = M_A g \Rightarrow F_R = \mu M_A g \right) *$

$\rightarrow \sum \bar{F}_B = M_B \bar{a}_B \rightarrow$ x) $F_R - T_B = M_B a_{Bx}$

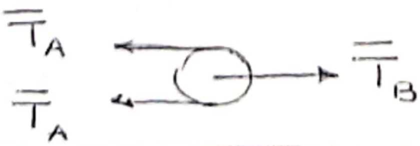
y) $N_B - P_B - N_A = 0$

Ecuaciones de vínculo

$\rightarrow$ Masa despreciable de sogas y poleas

(+ pares de interacción) $\Rightarrow T_B = 2T_A$

DCL polea móvil



$\sum \bar{F}_P = 0$

$T_B = 2T_A$

$\rightarrow$ Soga inextensible $\Rightarrow a_{Ax} = -2a_{Bx}$

$\frac{d^2}{dt^2}\left(L_{S_1} = x_A - x_{PF} + x_{PM} - x_{PF} + x_{PM} - x_{PARED} \right.$

$0 = a_{Ax} + 2a_{PM} \Rightarrow a_{Ax} = -2a_{PM}$

por $L_{S_2} \Rightarrow a_{PM} = a_{Bx}$

2b) Reemplazo vinculos y * en la componente x de las ecuaciones de movimiento

$$F - T_A - \mu M_A g = -2 M_A a_{Bx} \qquad (1)$$

$$\mu M_A g - 2 T_A = M_B a_{Bx} \qquad (11)$$

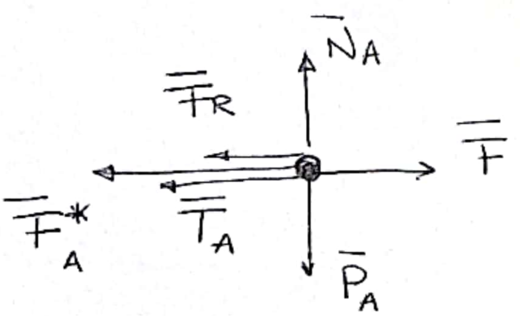
$2(1) - (11) \qquad 2F - 3\mu M_A g = -(4M_A + M_B)\, a_{Bx}$

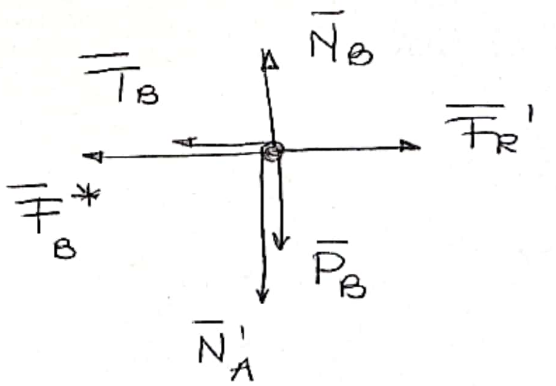
$$a_{Bx} = \frac{-(2F - 3\mu M_A g)}{(4M_A + M_B)}$$

$$\bar{a}_B = \frac{-(2F - 3\mu M_A g)}{(4M_A + M_B)}\,\check{i} = \boxed{\frac{3\mu M_A g - 2F}{(4M_A + M_B)}\,\check{i}}$$

$$\bar{a}_A = \frac{2(2F - 3\mu M_A g)}{(4M_A + M_B)}\,\check{i} = \boxed{\frac{4F - 6\mu M_A g}{(4M_A + M_B)}\,\check{i}}$$

2c) DCL M_A DCL M_B





EJERCICIO 3 (TOTAL 40 %)

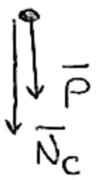
3a) $W^{N} = 0 \qquad (\bar{N} \perp d\bar{r})$

$$W^{FR} = \int \bar{F}_R \cdot d\bar{r} = \mu M g d \cos(180°) = -1\,J$$

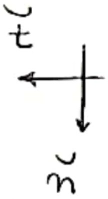
$$W^{P} = -\Delta E_p = -(M g h_c - \cancel{M g h_A}) = -8\,J$$

Considero $h_A = 0$

3b) DCL en C



SC



$\Sigma \bar{F} = M\bar{a}$

$n)\ P + N_C = M \dfrac{V_C^2}{R}$

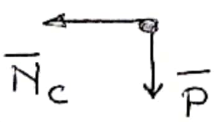
$$V_C = \sqrt{\frac{R}{M}(P + N_C)} = 4\,\frac{m}{s}$$

$$\Delta E_M^{AC} = \cancel{W^N} + W^{FR}$$

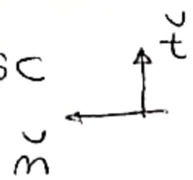
$$\frac{M}{2} V_C^2 + M g\, 2R - \frac{M}{2} V_A^2 = W^{FR}$$

$$16\,J + 16\,J - 1\,kg\, V_A^2 = -1\,J \rightarrow \boxed{\bar{V}_A = \sqrt{33}\,\frac{m}{s}\,\breve{t}}$$

3c) DCL en B



SC



$\Sigma \bar{F} = M\bar{a}$

$n)\ N_C = M \cdot a_{n_C}$

$t)\ -Mg = M a_{t_C}$

$a_{t_C} = -g$

$$\Delta E_M^{AB} = \cancel{W^N} + W^{FR}$$

$$\frac{M}{2} V_B^2 + M g R - \frac{M}{2} V_A^2 = W^{FR}$$

$$V_B^2 = 24\,\frac{m^2}{s^2} \Rightarrow a_{n_B} = \frac{V_B^2}{R} = 60\,\frac{m}{s^2} \longrightarrow \boxed{\bar{a} = -10\,\frac{m}{s^2}\,\breve{t} + 60\,\frac{m}{s^2}\,\breve{n}}$$