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1.a) Lei: $x_{(t)} = ct$
$y_{(t)} = ct(1 - Bt)$

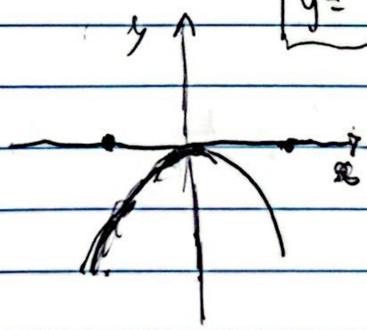
$$\begin{cases} x = ct \\ y = ct(1 - Bt) \end{cases} \Rightarrow \begin{cases} 1 = \frac{x}{c} \\ y = x \cdot \frac{x}{c}\left(1 - B \cdot \frac{x}{c}\right) \end{cases} \Leftrightarrow \begin{cases} t = \frac{x}{c} \\ y = x\left(1 - \frac{Bt}{c}\right) \end{cases} \Rightarrow \begin{cases} t = \frac{x}{c} \\ y = x\left(1 - x\frac{B}{c}\right) \end{cases}$$

$$\begin{cases} - \\ y = x - \frac{B}{c} \cdot x^2 \end{cases} \Leftrightarrow \begin{cases} - \\ y = \frac{-B}{c}x^2 + x \end{cases}$$

$\boxed{y = \frac{-Bx^2}{c} + x}$ eq. do 2º grau com $a < 0$ seja $a = \frac{2}{c}$

gráfico

$\boxed{y = -ax^2 + x}$



1.b) $v_x = \frac{dx(t)}{dt} = \frac{d(ct)}{dt} = v_x = c$

$v_y = \frac{dy(t)}{dt} = \frac{d(ct - Bct^2)}{dt} = c - 2Bct$

/ /

$v_x = c\ m/s$

$v_y = c\ m/s$

$v_y = c - 2Bct\ m/s$

$|v| = v_x^2 + v_y^2$

$|v| = c^2 + (c - 2Bct)^2$

$|v| = c^2 + c^2 - 2c \cdot 2Bct + (2Bct)^2$

$|v| = c^2 + c^2 - 4c^2 Bt + 4B^2 \cdot c^2 \cdot t^2$

$|v| = 2c^2 - 4c^2 Bt + 4B^2 \cdot c^2 \cdot t^2$

$|v| = 2c^2 (1 - 2Bt + 2B^2 \cdot t^2)\ m/s$

c) $r = \frac{v^2}{a_c}$

$a_c = a_y$

$r = \frac{2c^2(1 - Bt + B^2t^2)}{-Bt}$

$r = \frac{2c(1 - Bt + B^2t^2)}{B}$

2.a) $d\vec{r} = dx\,i + dy$

$d\vec{r} = dx\,i + (2dx)i$

$F = 2Ky\,i + y^2 j = 2x(2xj + x^2) = 4x^2 i + x^2 j$

$W = \int F \cdot dx^2 = \int (4x^2 + x^2 j) \cdot (dx(2 + 2j)) = \int (4x^2 + 2x^2)\,dx$

$W = \int (6x^2)\,dx = 2x^3 + c$

$W = 2(2^3) - 2(0^3) = 16$

$y = 2x$ an $W = 16$

b) $W_y = \int F \cdot dy = \int (x^2 \cdot dy) \cdot (dy \cdot y) = \int x^2\,dy$

$W_y = x^2 y + c$

$W_y = x^2(4) - x^2(0) = 4x^2$

Ne line x

$W_x = \int F \cdot dx = \int (2xyx) \cdot (dx\,i) = \int 2xy\,dx$

$W_x = x^2 y + c$

$W_x = (2^2 y - 0^2)y = 4y$

$W = W_y + W_x = 4x^2 + 4y$
$W_y = 4(0)^2 + 4(0) = 0$
$W_x = 4(2)^2 + 4 + 16 = 32$

2) A força não é conservativa porque a força a-d é diferente da força b:

3 - a) $\frac{m \cdot v^2}{R} = N$

$E_{PA} = E = B$
$mg \cdot h_{AB} = \frac{m \cdot v^2}{2}$

$v^2 = 2g\, h_{AB}$
$N = \frac{m \cdot 2g \cdot h_{AB}}{R} \Rightarrow N = \frac{2mg \cdot h_{AD}}{R}$

$h = \frac{R}{2} \cdot \cos 60°$

$h = \frac{R}{2} \cdot \frac{1}{2}$

$h = \frac{R}{4} = \frac{0,02}{4} = 0,005$

b) $N = \frac{2mg \cdot h_{AB}}{R}$

$N = \frac{2 \cdot 0,5 \cdot 10 \cdot 0,08}{0,005} = \frac{1 \cdot 10 \cdot 0,08}{0,005} = \frac{8}{0,005} = 1600$

4. a) $F_R = m \cdot a_{cm}$

$\frac{F_R}{m} = a_{cm}$ ou $a = \sum \frac{F_N}{v}$

$\frac{F_R}{M_A + M_B + m_C} = a \, x^m$

$a_{cm} = \left(\frac{d \, v_{cm}}{dt \, m}\right)$

$F_R = M \, \vec{a}_{cm}$

$10 = M \vec{a}_{cm}$

$a_{cm} = \frac{10}{M}$

b) $M_{cm} = \frac{M \, d \, v_{cm}}{dt}$

$a_{cm} = \frac{d \, \vec{v}_{cm}}{dt}$

$\frac{10}{m} = \frac{d \vec{v}}{dt \, v_{cm}}$

$\int \frac{96}{M} \, t \cdot dt = \int d r_{cm}$

$\frac{10}{M} \int_0^{t} t \, dt = \int_0^{r_{cm}} d r_{cm}$

$\frac{10}{2M} \cdot t^2 \int_0^{t} = \vec{r}_{cm} \Big|_0^{r_{cm}}$

$\frac{5}{M} \cdot t^2 = r_{cm}$

$y_{cm} = \frac{5}{m} t^2$

4-d) a_{cm} 1 $v_{cm} = \frac{m_A \cdot V_A + m_B \cdot V_B + m_C \cdot V_C}{m_A + m_B + m_C}$

$= 0{,}5 \cdot (-40)t + 9{,}3 (38 \cos 55 i + 38 \sin 55)$

$= 0{,}2 \cdot 31{,}92 \cos 55 j + 31 \cdot 92 j\, d - 99 \cdot 35 j \,/\, 0{,}5 + 0{,}3 + 0{,}2$

$= -20 i + 6{,}59 i + 9{,}36 j - 13{,}4 i - 9{,}4 j$

$= 26{,}86 i - 0{,}06 j$