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Física

1- $x(t) = ct$

$y(t) = ct(1 - \beta t)$

a) $t = \frac{x}{c} \Rightarrow y(x) = \left(\frac{x}{c}\right)\left[1 - \beta\left(\frac{x}{c}\right)\right]$

$= \frac{x}{c} - \frac{\beta x^2}{c^2}$

b) $\frac{dx}{dt} = c \quad e \quad \frac{dy}{dt} = c(1 - 2\beta t)$

$|v(t)| = \sqrt{\left(\frac{dx}{dt}\right)^2} + \sqrt{\left(\frac{dy}{dt}\right)^2}$

$|v(t)| = \sqrt{c^2 + c^2(1 - 2\beta t)^2}$

$= \sqrt{(2c^2 - 4c^2\beta t^2 + 4c^2\beta^2 t^2}$

c) $r = \sqrt{(x^2 + y^2}$

$r = \sqrt{ct^2 + ct(1 - \beta t)^2}$

$r = \sqrt{2c^2t^2 - 2c^2\beta t^3 + c^2\beta^2 t^4}$

2- $\vec{F} = 2xy\vec{i} + x^2\vec{j}$

$A(0;0)$

$B(2;4)$

$W = \int \vec{F}\, dr$

a) $y = 2x$

$dr = dx\vec{i} + 2dx\vec{j}$

$W = \int (2x\vec{i} + x^2) \cdot (dx\vec{i} + 2dx\vec{j})$

$= \int (2x\,dx + 2x^2\,dx)$

$= \int (2x + 2x^2)\,dx$

$= \int 2x\,dx + \int 2x^2\,dx$

$= 2^2 + \left(\frac{2}{3}\right) \cdot 2^3 - 0$

$= 4 + \left(\frac{16}{3}\right) - 0$

$= \frac{12}{3} + \frac{16}{3}$

$= \frac{28}{3} = 9{,}3\ J$

b) $y(0.4) \quad x(2;4)$

$dr = 0i + dy\,j$

$W = \int (2xi + x^2 j)(0i + dy\,j)$

$= \int x^2\,dy$

$= x^2 y \Big|_0^4$

$= 2^2 \cdot 4 - 0$

$= 16\ J$

$W = \int (2x\,i + x^2 j)(dx\,i + 0\,j)$

$= \int 2x\,dx$

$= x^2 \Big|_0^2$

$= 4\ J$

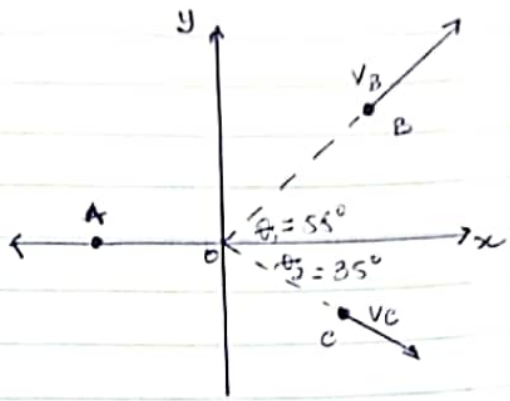
$W_T = 16 + 4$

$W_T = 20\ J$

c) $W_1 \neq W_2$

$9{,}3 \neq 20 \Rightarrow$ o trabalho varia com a trajetória então ela não é conservativa.

4-




a) $a_{cm} = 0$

b) $v_{cm} = \dfrac{mA \cdot vA + mB \cdot vB + mC \cdot vC}{mA + mB + mC}$

$v_{cm} = \dfrac{0,50 \cdot 40 + 0,30 \cdot 38,24 + 0,20 \cdot 81,92}{0,50 + 0,30 + 0,20}$

$v_{cm} = 47,8 \text{ m/s}$

c) $x_{cm} = \dfrac{mA \cdot xA + mB \cdot xB + mC \cdot xC}{mA + mB + mC}$

$x_{cm} = \dfrac{0,50 \cdot 0 + 0,30 \cdot 0 + 0,20 \cdot 0}{0,50 + 0,30 + 0,20}$

$x_{cm} = 0 m$