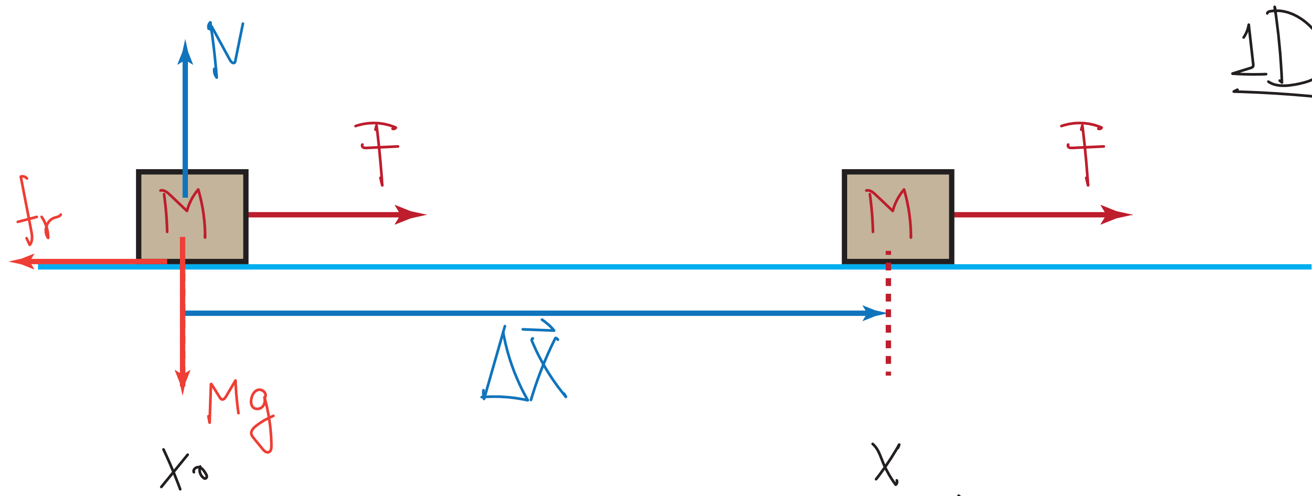
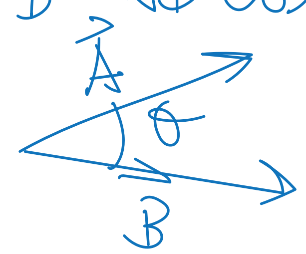
1D



$$W_T = W_F + W_N + W_{Mg} + W_{fr}$$

$$W = \vec{F} \cdot \Delta\vec{X} = F \Delta X \cos\theta$$

$$\vec{A} \cdot \vec{B} = AB\cos\theta$$



$$W_F = F \Delta X \cancel{\cos\theta_1}^{\,1}$$

$$\theta_1 = 0$$

$$\cos 0 = 1$$

$$W_F = F \Delta X$$

$$|\Delta\vec{X}| = d$$

$$W_F = Fd$$

$$W_N = N \Delta X \cancel{\cos\theta_2}^{\,0}$$

$$\theta_2 = 90$$

$$\cos 90 = 0$$

$$W_N = 0$$

$$W_{Mg} = (Mg)\Delta X \cos\theta_3$$

$$\theta_3 = 270$$

$$\cos 270 = 0$$

$$W_{Mg} = Mg \Delta X \cdot 0 = 0$$

$$W_{Mg} = 0$$

$$W_{fr} = f_r \Delta X \cancel{\cos\theta_4}^{\,-1}$$

$$\theta_4 = 180$$

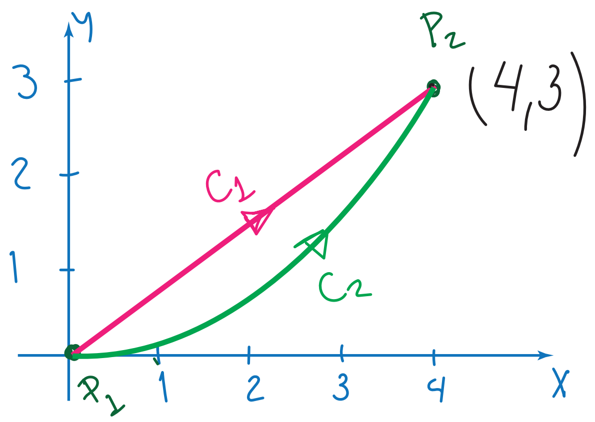
$$\cos\theta_4 = \cos 180 = -1$$

$$W_{fr} = f_r d$$

$$W_T = Fd + 0 + 0 + f_r d = d(F + f_r)$$

$$\boxed{W_T = d(F - f_r)}$$

Se tiene una fuerza **F** = (2y²x **i** + 2x²y **j**) N, verifique si la fuerza es o no conservativa. **R. Si**



$C_1 \Rightarrow$ Recta $(y = A + Bx)$

$C_2 \Rightarrow$ Parabola $(y = ax^b)$

$b = 2$

$$\vec{F} = \underbrace{2y^2x}_{F_x}\,\hat{i} + \underbrace{2x^2y}_{F_y}\,\hat{j}$$

$$\begin{cases} F_x = 2y^2x \\ F_y = 2x^2y \end{cases}$$

Caso I $\quad W_{C_1} = ?$

$$W = \int F_x\,dx + \int F_y\,dy + \int \cancel{F_z}^{\,0}\,dz$$

$$W_{C_1} = \int 2y^2x\,dx + \int 2x^2y\,dy$$

$$W_{C_1} = 2\int y^2x\,dx + 2\int x^2y\,dy$$

$y = \frac{1}{2}x \quad ; \quad x = 2y$

Si $\quad y = A + Bx$

$A = 0$

$$B = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$B = \frac{2-0}{4-0} = \frac{1}{2} = 0{,}5$$

$$W_{C_1} = 2\int \left(\tfrac{1}{2}x\right)^2 x\,dx + 2\int (2y)^2 y\,dy$$

$$W_{C_1} = \frac{1}{2}\int_{x_0=0}^{x=4} x^3\,dx + 8\int_{y_0=0}^{y=3} y^3\,dy = \frac{1}{2}\cdot\frac{x^4}{4}\Big|_0^4 + \cancel{8}^{\,2}\cdot\frac{y^4}{\cancel{4}}\Big|_0^3$$

$$W_{C_1} = \frac{1}{8}\left(4^4 - 0^4\right) + 2\left(3^4 - 0^4\right)$$

$$W_{C_1} = \frac{1}{8}\left(4^4\right) + 2\left(3^4\right) \Rightarrow \boxed{W_{C_1} = 194\ \text{J}}$$

$y = \frac{1}{2}x$

$y = f(x)$

$$\frac{dy}{dx} = \frac{d\left(\frac{1}{2}x\right)}{dx} = \frac{1}{2}\frac{\cancel{dx}}{\cancel{dx}}^{\,1}$$

$$\frac{dy}{dx} = \frac{1}{2} \Rightarrow \boxed{dy = \frac{1}{2}dx}$$

$$W_{c_1} = 2\int y^2 x\,dx + 2\int x^2 y\,dy$$

$$y = \frac{1}{2}x \qquad dy = \frac{1}{2}dx$$

$$W_{c_1} = 2\int \left(\frac{1}{2}x\right)^2 x\,dx + 2\int x^2\left(\frac{1}{2}x\right)\left(\frac{1}{2}dx\right)$$

$$W_{c_1} = \frac{1}{2}\int x^3\,dx + \frac{1}{2}\int x^3\,dx = \cancel{2}\left(\frac{1}{\cancel{2}}\int x^3\,dx\right)$$

$$W_{c_1} = \int_{x_0=0}^{x=4} x^3\,dx = \left.\frac{x^4}{4}\right|_0^4 = \frac{1}{4}(4^4 - 0^4)$$

$$W_{c_1} = \frac{1}{4}\cdot 4^4 = 4^3 = 64\ J$$

$$W_{c_2} = ?$$

$$y = ax^2$$

$$a = \frac{y}{x^2} = \frac{3}{4^2}$$

$$a = \frac{3}{16}$$

$$y = \frac{3}{16}x^2$$

$$W_{c_2} = 2\int y^2 x\,dx + 2\int x^2 y\,dy$$

$$y = \frac{3}{16}x^2 \Rightarrow x^2 = \frac{16}{3}y$$

$$W_{c_2} = 2\int\left(\frac{3}{16}x^2\right)^2 x\,dx + 2\int\left(\frac{16}{3}y\right)y\,dy$$

$$W_{c_2} = 2\left(\frac{3}{16}\right)^2\int_0^4 x^5\,dx + \frac{32}{3}\int_0^3 y^2\,dy$$

$$W_{c_2} = \overset{1}{\cancel{2}}\left(\frac{3}{16}\right)^2 \left.\frac{x^6}{\underset{3}{\cancel{6}}}\right|_0^4 + \frac{32}{3}\cdot\left.\frac{y^3}{3}\right|_0^3 = \frac{3}{16^2}(4^6 - 0^6) + \frac{32}{\underset{3^2}{9}}(3^3 - 0^3)$$

$$W_{c_2} = \frac{3}{16^2}\cdot 4^6 + 32\cdot 3 \Rightarrow W_{c_2} = 144\ J$$