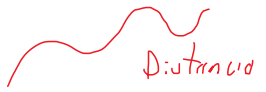
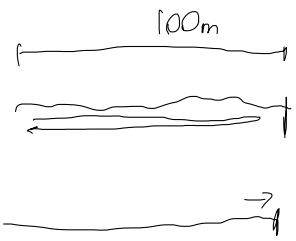
Cinematica

sábado, 30 de abril de 2022 02:06 p. m.

- Desplazamiento
- Distancia
- Velocidad
- Aceleración

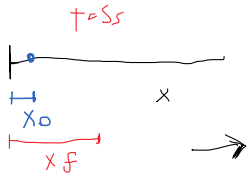




→ Distancia recorrida?
$d = 200m$

→ Desplazamiento
$\Delta x = 0m$

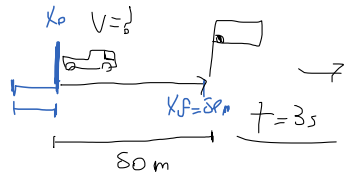
$\Delta x = x_f - x_0$ | Movimiento Rectilineo Uniforme | MRU



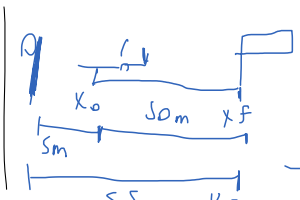
$= 20 - 10 = 10m$

$V = \frac{x_f - x_0}{t} = \frac{\Delta x}{t} = \frac{10m}{5s}$, $V = 2 m/s$

$x_0 = 0$



$\Delta x = 50 - 0 = 50m$

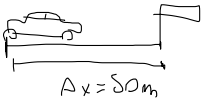


$x_0 = 5m$
$x_f = 55m$

$\Delta x = x_f - x_0$
$\Delta x = 50m$

$V = \frac{\Delta x}{t} = \frac{50m}{3s} = 16.66 m/s$

→ $V = 80m/s$, → $t = ?$



$V = \frac{\Delta x}{t}$, $tv = \Delta x$

$t = \frac{\Delta x}{V}$

$t = \frac{50m}{80 m/s} = 1.6s$

$t = \frac{1.6}{1/s} = 1.6s$

→ $v = 1m/s$

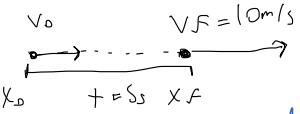
$t = 3min\,30s = 210s$

$tv = \Delta x$

$\Delta x = vt$ → $\Delta x = (1m/s)(210s)$

$\Delta x = 210m$

→ Movimiento Uniformemente acelerado



$a = \frac{V_f - V_0}{t}$, $a = \frac{10m/s - 5m/s}{5s} = \frac{5m/s}{5s} = 1 m/s^2$

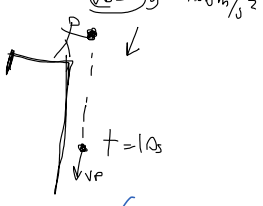
→ Caida libre

g

Conocer la velocidad.

$a = \frac{V_f - V_0}{t}$ → $at = V_f - V_0$, $V_f = at + V_0$

$a = g$

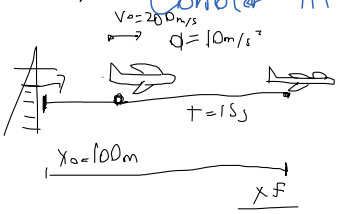


→ $V_f = gt + V_0$ ($V_0 = 0$)

$9.8(10) = 98 m/s$

→ Conocer la posición

→ Conocer la posición?

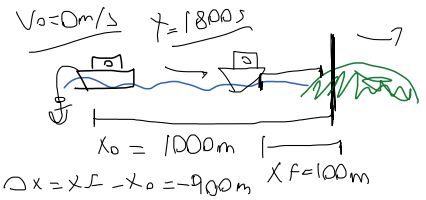


→ MUA | $X_f = X_0 + v_0 t + \frac{a t^2}{2}$

$X_f = 100m + (200m/s)(15s) + \frac{(10m/s^2)(15^2)}{2}$

$X_f = 4225m = 4.225km$

Conocer la aceleración?

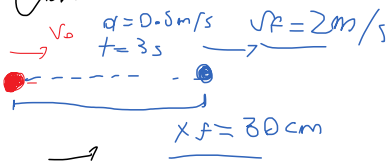


$X_f = X_0 + V_0 t + \frac{a t^2}{2}$

$X_f - X_0 - V_0 t = \frac{a t^2}{2} \rightarrow a = \frac{2(X_f - X_0 - V_0 t)}{t^2}$

$a = \frac{(100m - 1000m)}{(1800s)^2}$, $a = \frac{-900}{1800^2}$, $a = -0.00027 m/s^2$

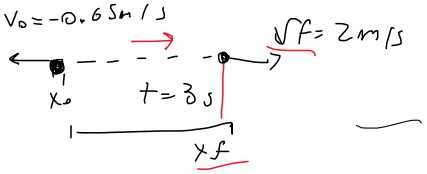
→ Conocer velocidad inicial



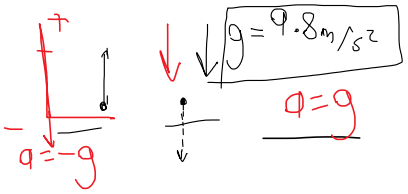
$X_f = X_0 + V_0 t + \frac{a t^2}{2}$

$V_0 t = (X_f - X_0) - \frac{a t^2}{2}$

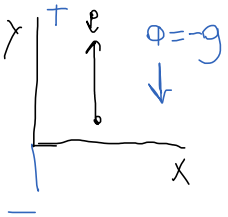
$V_0 = \frac{(X_f - X_0)}{t} - \frac{at}{2} = -0.65 m/s$



→ Caída libre:



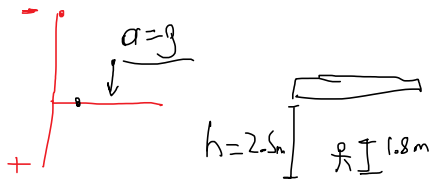
$\Delta y = Y_f - Y_0$



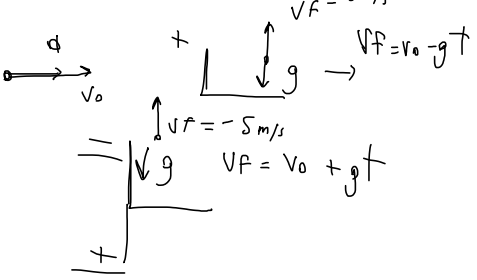
MUA para caída libre

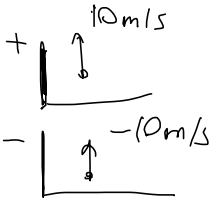
$V_f = V_0 - gt$

$y_f = y_0 + v_0 t - g\frac{t^2}{2}$

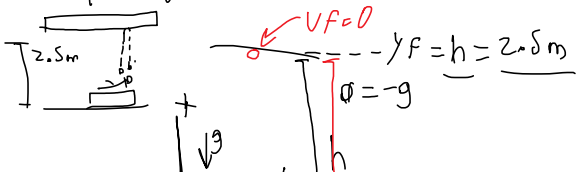


$V_f = V_0 + at$



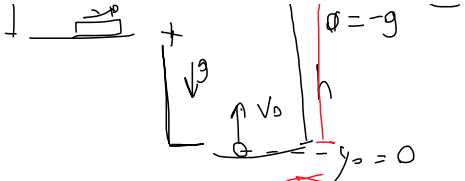


→ Velocidad mínima para que llegue al techo



$X_f = X_0 + V_0 t + \frac{a t^2}{2}$

$a = V_f - V_0$, → $t^2 = (V_f - V_0)^2$



$V_f^2 - V_0^2 = 2a\Delta x$

$0 - V_0^2 = -2gh$

$+V_0^2 = +2gh$

$V_0 = \sqrt{2gh} = 7 m/s$

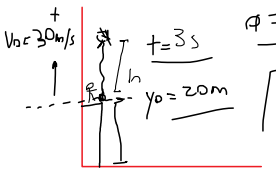
$t = \frac{V_f - V_0}{a}$, $t^2 = \frac{(V_f - V_0)^2}{a^2}$

$(x_f - x_0) = V_0\left(\frac{V_f - V_0}{a}\right) + \frac{1}{2}a\frac{(V_f - V_0)^2}{a^2}$

$\Delta x = \frac{V_0 V_f}{a} - \frac{V_0^2}{a} + \frac{V_f^2 - 2V_f V_0 + V_0^2}{2a}$

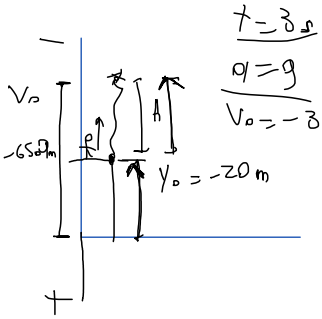
$\Delta x = \frac{V_0 V_f}{a} - \frac{V_0^2}{a} + \frac{V_f^2}{2a} - \frac{V_f V_0}{a} + \frac{V_0^2}{2a}$

$\Delta x = \frac{V_f^2}{2a} - \frac{V_0^2}{2a} = \frac{1}{2a}(V_f^2 - V_0^2)$



$y_f = y_0 + V_0 t - \frac{g t^2}{2} = 20m + (30)(3) - \frac{(9.8)(3)^2}{2}$

$y_f = 65.9m$, $h = y_f - y_0 = 65.9m - 20m = 45.9m$



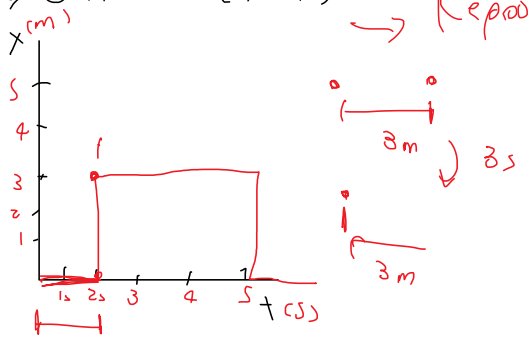
$y_f = y_0 + V_0 t + \frac{a t^2}{2}$

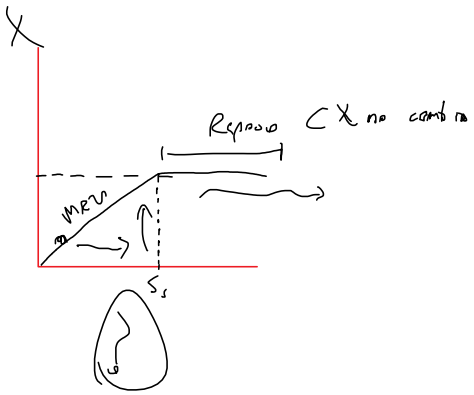
$y_f = -20m - (30 m/s)(3) + \frac{(9.8)(9)}{2}$

$y_f = -65.9m$, $h = y_f - y_0 = -65.9 - (-20m) = -45.9m$

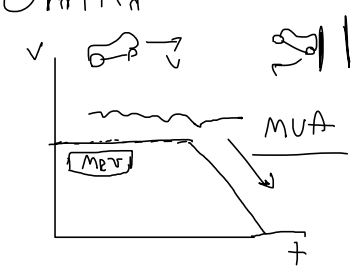
Analisis Grafico

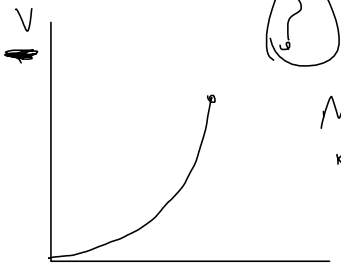
→ Grafica (x,t) → Reposo. (Mantiene su posición)





Grafica (v,t)





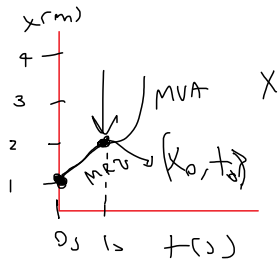
Movimiento con aceleración variable

x

(Parabola) $y = ax^2$

$x_f = x_0 + v_0 t + \frac{a t^2}{2}$

(Parabola) $X_f = X_0 + V_0 t + \frac{at^2}{2}$

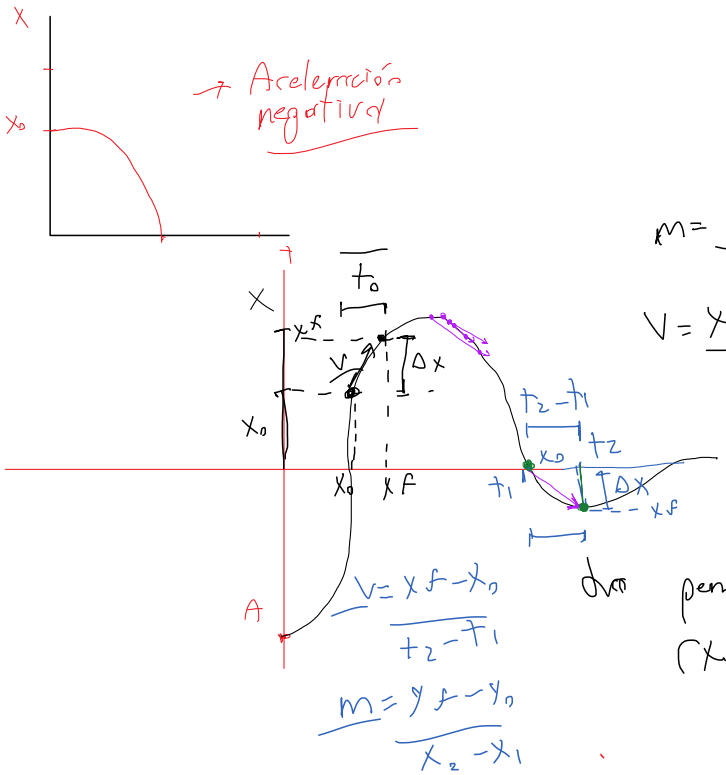


$y = mx + b$

$x = vt$

A partir de 1s

$X = X_0 + V_0 t + \frac{at^2}{2}$

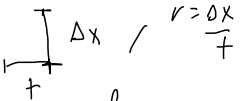


$m = \frac{y_f - y_0}{x_f - x_0} = \frac{\Delta X}{t} = V$

$V = \frac{X_f - X_0}{t} = \frac{\Delta X}{t}$

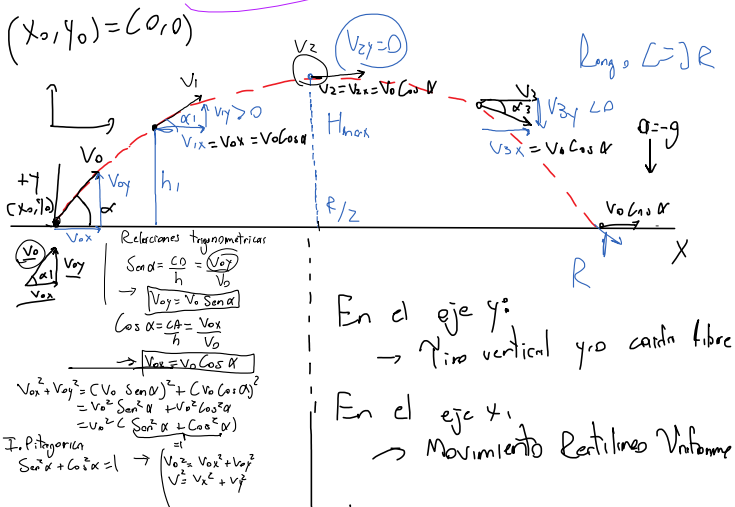
$V = \frac{X_f - X_0}{t_2 - t_1}$

$m = \frac{y_f - y_0}{x_2 - x_1}$



Una pendiente en gráficas (x vs t) es la velocidad

→ Tiro Parabólico (En la superficie terrestre)



Relaciones trigonométricas

$\sin\alpha = \frac{CO}{h} = \frac{V_{0y}}{V_0}$

$\rightarrow V_{0y} = V_0 \sin\alpha$

$\cos\alpha = \frac{CA}{h} = \frac{V_{0x}}{V_0}$

$\rightarrow V_{0x} = V_0 \cos\alpha$

$V_{0x}^2 + V_{0y}^2 = (V_0 \sin\alpha)^2 + (V_0 \cos\alpha)^2$

$= V_0^2 \sin^2\alpha + V_0^2 \cos^2\alpha$

$= V_0^2 (\sin^2\alpha + \cos^2\alpha)$

$= 1$

I. Pitagorica

$\sin^2\alpha + \cos^2\alpha = 1 \rightarrow V_0^2 = V_{0x}^2 + V_{0y}^2$

$V^2 = V_x^2 + V_y^2$

En el eje y:
→ Tiro vertical y/o caída libre

En el eje x:
→ Movimiento Rectilíneo Uniforme

→ Se cumple lo siguiente:

En x: (MRU)

En y: (MUA)

$y = V_{0y} t - \frac{gt^2}{2} = V_0 \sin\alpha\, t - \frac{gt^2}{2}$

→ Se compone en

En x: (MRU)

$x = v_x t = v_0 \cos\alpha\, t$

$x = (v_0 \cos\alpha)\, t$

En y: (MVA)

$y = v_{0y} t - \frac{g t^2}{2} = v_0 \sin\alpha\, t - \frac{g t^2}{2}$

$y = v_0 \sin\alpha\, t - \frac{g t^2}{2}$

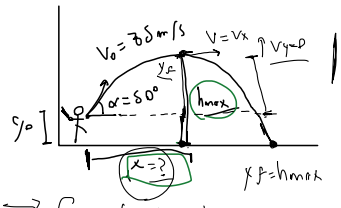
$v_y = v_{0y} - g t$

$v_y = v_0 \sin\alpha - g t$

$v_y^2 - v_{0y}^2 = -2 g \Delta y$

$v_y^2 = v_0^2 \sin^2\alpha - 2 g \Delta y$ ←

$y_0 = 1m$



$v_y = 0$

$v_0^2 \sin^2\alpha = 2 g \Delta y = 2 g (y_f - y_0)$

$y_f - y_0 = \frac{v_0^2 \sin^2\alpha}{2g}$

$h_{max} = y_0 + \frac{v_0^2 \sin^2\alpha}{2g}$

$h_{max} = 37.67 m$

→ En el eje x:

$x = v_0 \cos\alpha\, t_*$ ←

→ Volvemos a analizar en y_0

$v_f = v_{0y} - g t_*$

$v_0 \sin\alpha - g t_* = 0$

$t_* = \frac{v_0 \sin\alpha}{g} =$

$x = v_0 \cos\alpha \left(\frac{v_0 \sin\alpha}{g}\right)$

$x = \frac{v_0^2 \cos\alpha \sin\alpha}{g}$

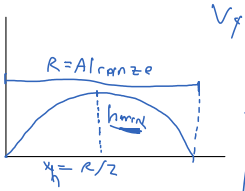
$2 \sin\alpha \cos\alpha = \sin(2\alpha)$

$\cos\alpha \sin\alpha = \frac{\sin(2\alpha)}{2}$

→ $x = \frac{v_0^2 \sin(2\alpha)}{2g} = 61.55 m$

→ $v_y = v_{0y} - g t$ // En h_{max}, $v_y = 0$

$\therefore t = \frac{v_{0y}}{g} = \frac{v_0 \sin\alpha}{g}$



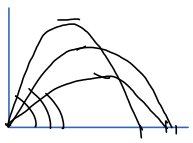
→ $x = v_0 \cos\alpha\, t = \frac{v_0^2 \cos\alpha \sin\alpha}{g}$

$x_h = \frac{v_0^2 \sin(2\alpha)}{2g}$ → x para h_{max}

$x_h = \frac{R}{2}$ → $R = 2 x_h$

$R = \frac{v_0^2 \sin(2\alpha)}{g}$

→ $-1 \le \sin\theta \le 1$, → Conocer α, para que R sea máximo dada v_0.



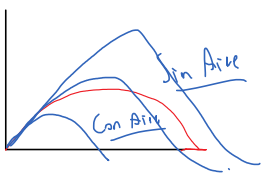
R_{max} → $\sin\theta = 1$

$2\alpha = 90°$

$\alpha = 45°$

$\sin(2\alpha) = 1$

(b, c)



→ $\vec{f}$

$f = bv$ ← dent.

$f = cv^2$ ← Rapidos