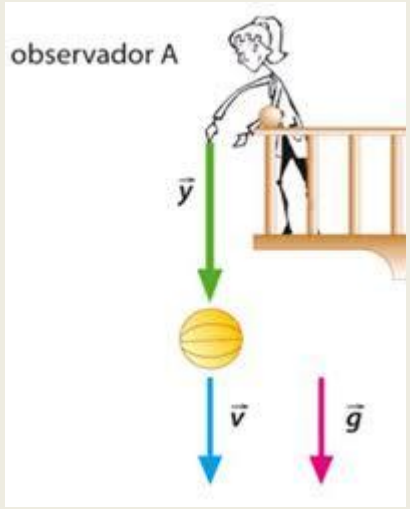
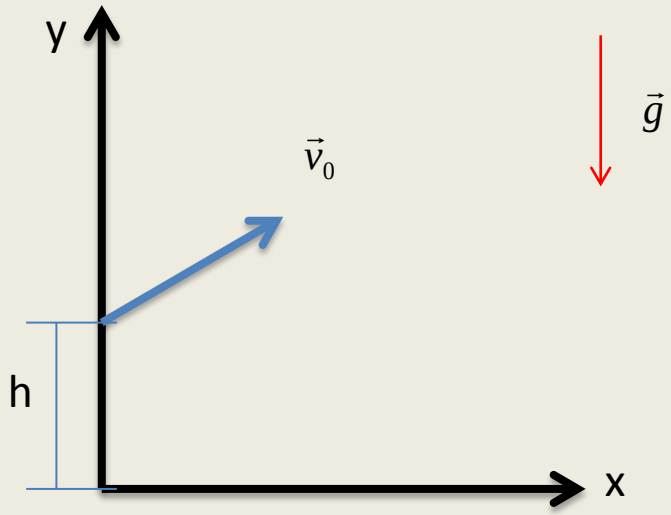
Tiro vertical de corto alcance





Condiciones iniciales

$$\vec{r} = 0\hat{i} + h\hat{j}$$

$$\vec{v}_0 = v_0 \cos\alpha \hat{i} + v_0 sen\alpha \hat{j} = v_{0x}\hat{i} + v_{0y}\hat{j}$$

Solución de las ecuaciones

En la dirección de las $\hat{i}$

$$v_x(t) = v_{0x}$$

$$x(t) = v_{0x}t$$

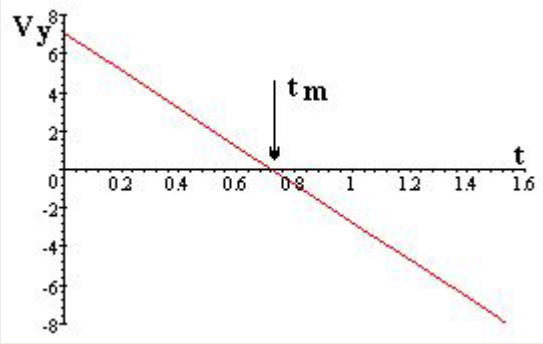
En la dirección de las $\hat{j}$

$$v_y(t) = v_{0y} - gt$$

$$y(t) = y_0 + v_{0y}t - \frac{1}{2}gt^2$$

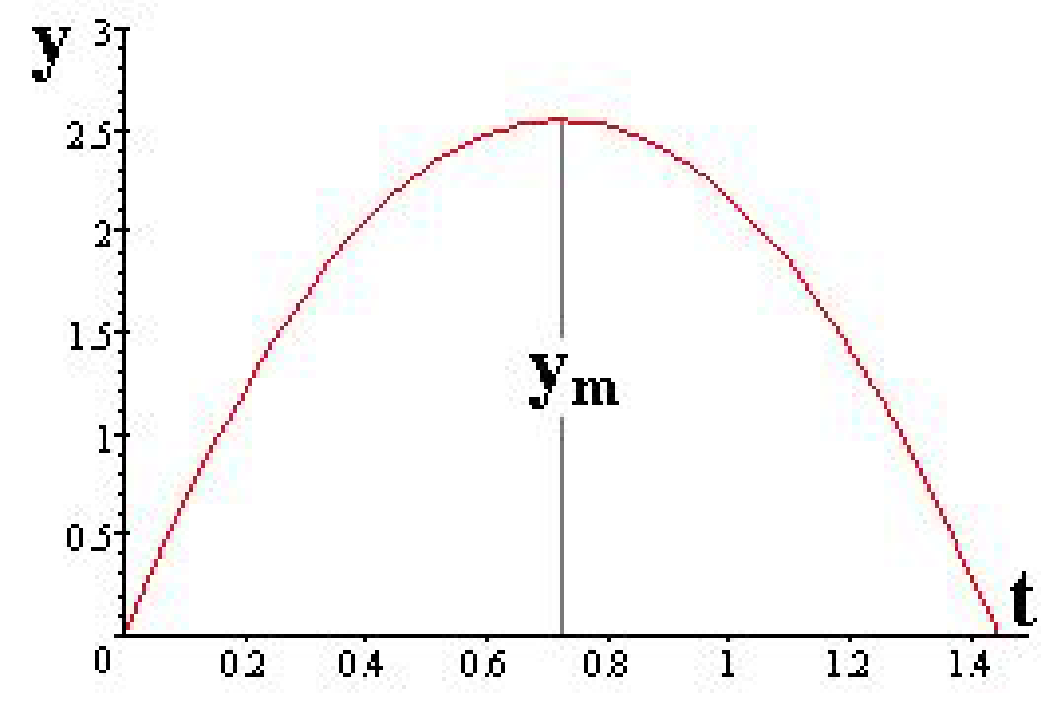
$$v_y(t) = v_{0y} - gt \Rightarrow 0 = v_{0y} - gt_m$$

$$t_m = \frac{v_{0y}}{g}$$



$$y_m = y_0 + \frac{v_{0y}^2}{2g}$$

Si $y_0 = 0$

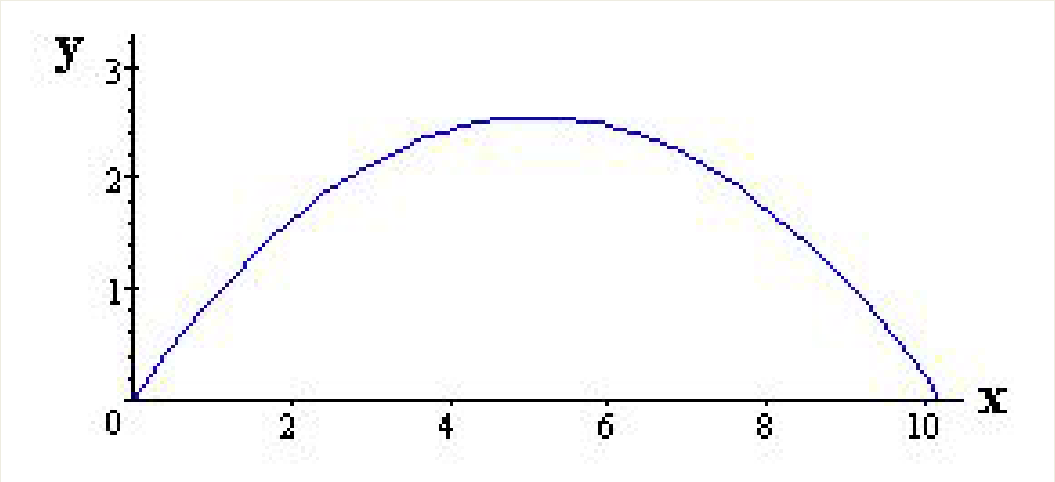


Trayectoria

$$x(t) = v_{0x}t \quad \Rightarrow \quad \frac{x}{v_{0x}} = t$$

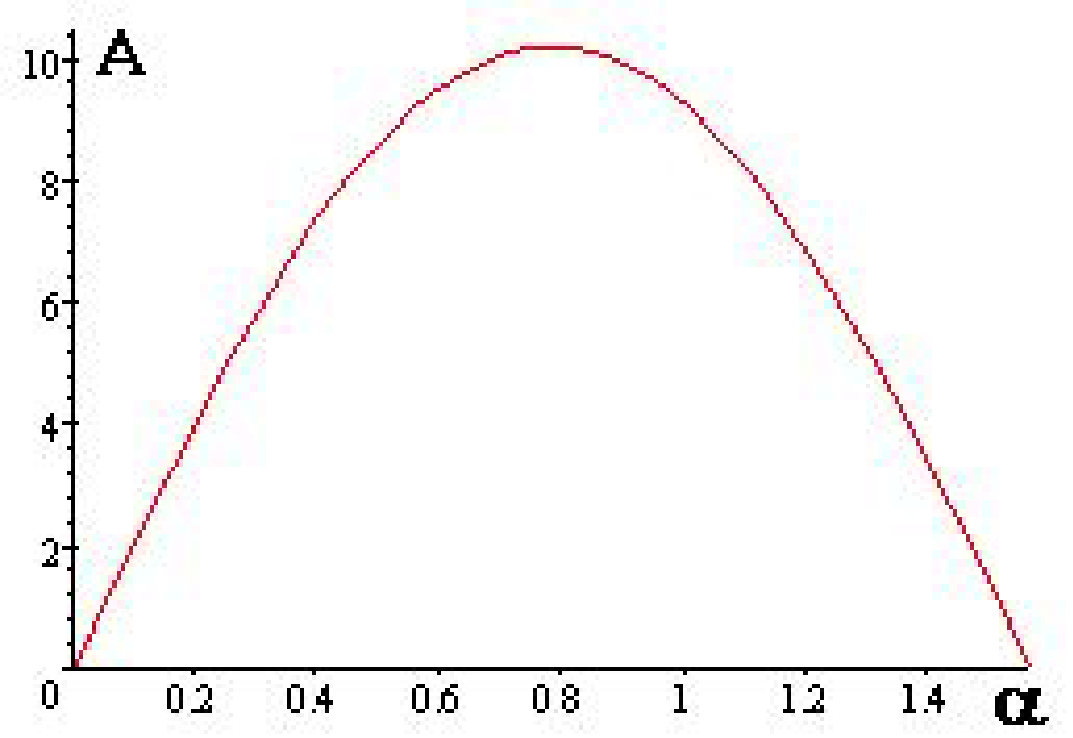
$$si\ tomamos \quad y_0 = 0$$

$$y(t) = \frac{v_{0y}}{v_{0x}}x - \frac{1}{2}\frac{g}{v_{0x}^2}x^2$$

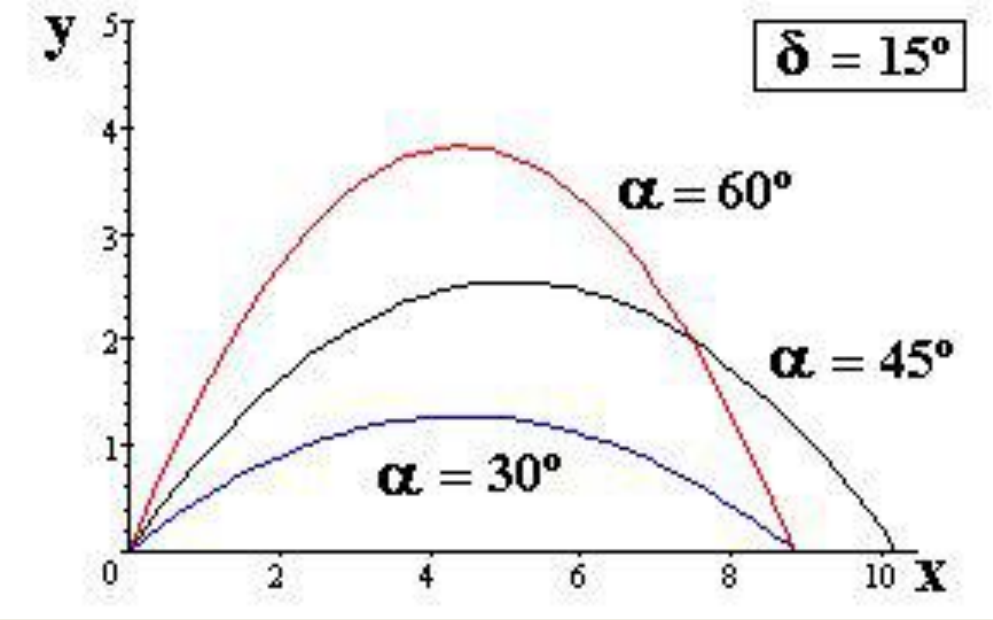


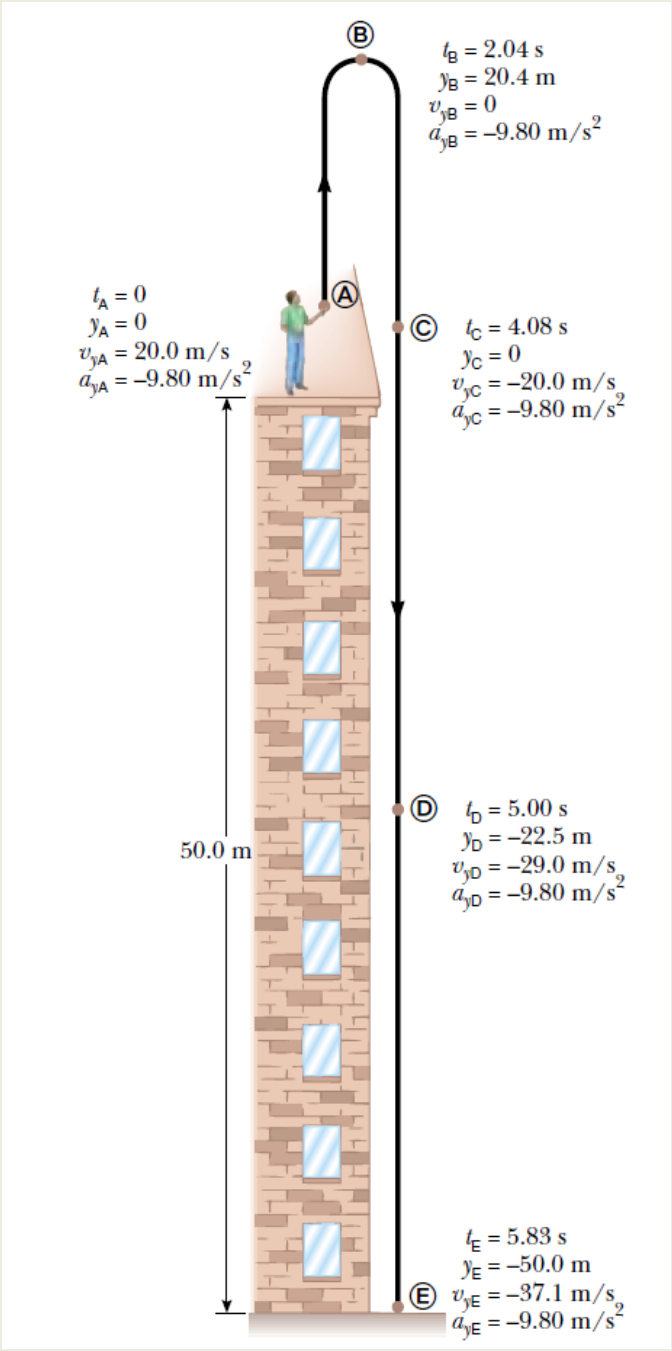
Alcance

$$A = \frac{v_0}{g} sen(2\alpha)$$



$$A = \frac{v_0}{g} sen(2\alpha + \delta) = \frac{v_0}{g} sen(2\alpha - \delta)$$




B
$t_B = 2.04$ s
$y_B = 20.4$ m
$v_{yB} = 0$
$a_{yB} = -9.80$ m/s^2
A
$t_A = 0$
$y_A = 0$
$v_{yA} = 20.0$ m/s
$a_{yA} = -9.80$ m/s^2
C
$t_C = 4.08$ s
$y_C = 0$
$v_{yC} = -20.0$ m/s
$a_{yC} = -9.80$ m/s^2
50.0 m
D
$t_D = 5.00$ s
$y_D = -22.5$ m
$v_{yD} = -29.0$ m/s
$a_{yD} = -9.80$ m/s^2
E
$t_E = 5.83$ s
$y_E = -50.0$ m
$v_{yE} = -37.1$ m/s
$a_{yE} = -9.80$ m/s^2