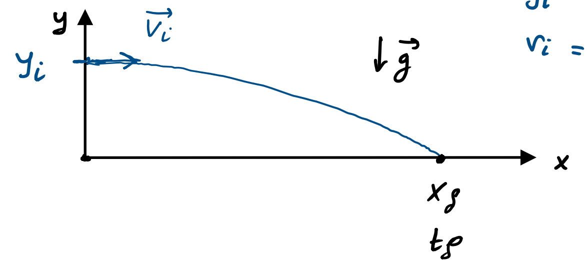
3.14



$y_i = 1{,}6\ m$

$v_i = 1100\ m/s$

(a) temps de vol t_f.

$$\Delta y = y_f - y_i = -y_i = -\frac{1}{2} g t_f^2 + \cancel{v_{iy}} \cdot t_f \quad (v_{iy} = 0)$$

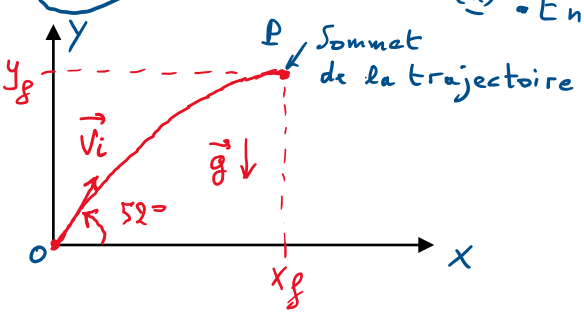
$$\Rightarrow -y_i = -\frac{1}{2} g t_f^2$$

$$\Rightarrow t_f = \sqrt{\frac{2 \cdot y_i}{g}} = \sqrt{\frac{2 \cdot 1{,}60}{9{,}81}} = \underline{\underline{0{,}57\,s}}$$

NB : identique au lâcher vertical d'un hauteur y_i !

(b). portée, $x_f = v_i \cdot t_f = 1100 \cdot 0{,}57 \simeq \underline{\underline{628\ m}}$

3.15



(a) • En P, $v_y = 0$ $\Rightarrow$ $\Delta y = y_f = \frac{1}{2a_y}(v_{y_f}^2 - v_{y_i}^2)$

$$= \frac{1}{2 \cdot (-9{,}81)} (0 - v_{y_i}^2)$$

$$= \frac{(v_i \sin\alpha)^2}{2 \cdot 9{,}81} = \frac{(18 \cdot \sin 52)^2}{2 \cdot 9{,}81} \simeq \underline{\underline{10\ m}}$$

(b). $\Delta x = x_f = v_{ix}\, \Delta t = v_i \cos\alpha\, \Delta t$

Il faut chercher Δt !

$v_{fy} = 0$ (en P !)

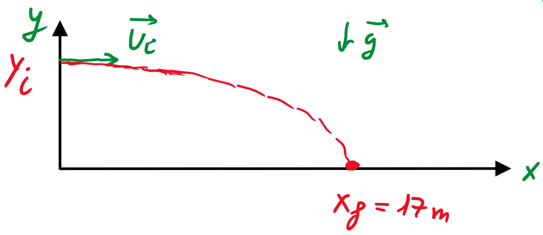
Selon y : $a_y = \frac{v_{fy} - v_{iy}}{\Delta t} = \frac{-v_{iy}}{\Delta t}$

$$\Rightarrow \Delta t = -\frac{v_{iy}}{a_y} = -\frac{v_i \sin\alpha}{a_y}$$

$$\Rightarrow x_f = -v_i \cos\alpha \cdot \frac{v_i \sin\alpha}{a_y} = -v_i^2 \cos\alpha \sin\alpha \cdot \frac{1}{a_y} = -18^2 \cos 52 \cdot \sin 52 \cdot \frac{1}{-9{,}81} \simeq 16\ m$$

$\Rightarrow$ Donc distance $\overline{OP} = \sqrt{y_f^2 + x_f^2} = \sqrt{10^2 + 16^2} \simeq \underline{\underline{19\ m}}$

3.16



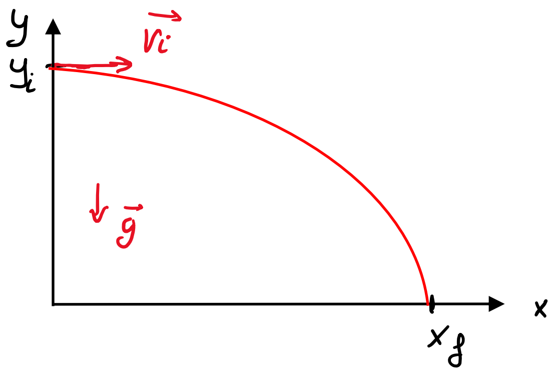
$$v_i = \frac{144\ km/h}{3{,}6} = 40\ m/s$$

• Portée $= \Delta x = x_f = v_i \cdot \Delta t \Rightarrow 17 = 40 \cdot \Delta t \Rightarrow \Delta t = \frac{17}{40}$

• Selon y : $\Delta y = -y_i = \frac{1}{2} a_y (\Delta t)^2$

$$\Rightarrow y_i = -\frac{1}{2} \cdot (-9{,}81) \left(\frac{17}{40}\right)^2 \simeq \underline{0{,}89\ m}$$

3.17



• portée $= \Delta x = x_f = v_i \cdot \Delta t$

$\Rightarrow 130 = v_i \cdot \Delta t$ 2 inconnues !

$\Rightarrow \Delta t = \dfrac{130}{v_i}$

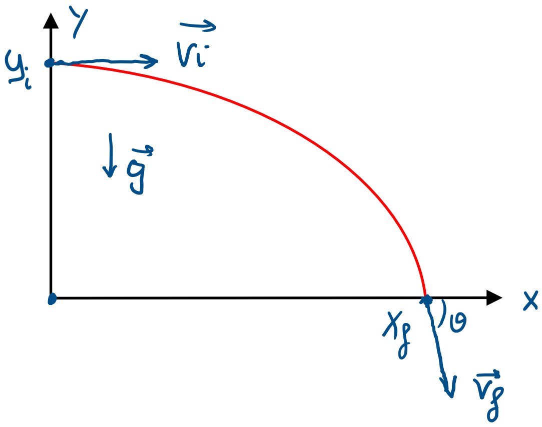
• Selon y : $\Delta y = -y_i = \frac{1}{2} a_y (\Delta t)^2$

$-y_i = -54 = \frac{1}{2}(-9{,}81) \cdot \left(\dfrac{130}{v_i}\right)^2$

$\Rightarrow 108 = 9{,}81 \cdot \dfrac{130^2}{v_i^2}$

$\Rightarrow v_i^2 = 9{,}81 \cdot \dfrac{130^2}{108} \Rightarrow v_i \cong \underline{\underline{39 \text{ m/s}}}$

3.18



(a). temps de vol Δt : $\Delta y = -y_i = \frac{1}{2} a_y (\Delta t)^2$

$-300 = \frac{1}{2}(-9{,}81)(\Delta t)^2$

$\Rightarrow \Delta t = \sqrt{\dfrac{2 \cdot 300}{9{,}81}} \cong \underline{\underline{7{,}82 \text{ s}}}$

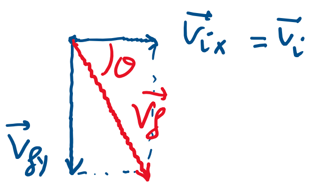
(b). Calcul de v_f. Selon y : $\Delta y = \dfrac{1}{2a_y} \cdot (v_{fy}^2 - v_{iy}^2)$

$\Rightarrow \Delta y = -y_i = \dfrac{1}{2 \cdot (-9{,}81)} v_{fy}^2 = -300$

$\Rightarrow v_{fy}^2 = 300 \cdot 2 \cdot 9{,}81$

donc $v_f^2 = \underset{\text{Selon } x}{v_i^2} + v_{fy}^2 \Rightarrow v_f = \sqrt{\left(\dfrac{400}{3{,}6}\right)^2 + 300 \cdot 2 \cdot 9{,}81} \cong \underline{\underline{135 \text{ m/s}}}$

(c).

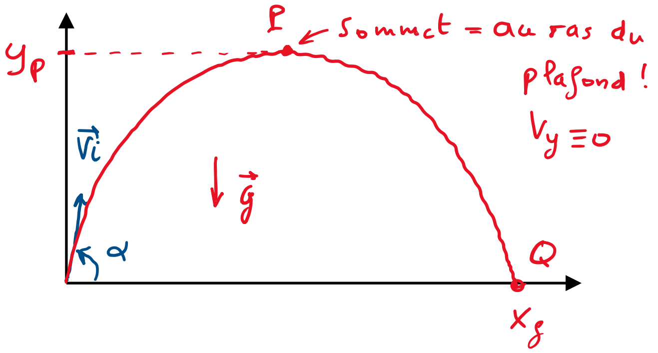


$\theta = \arctan\left(\dfrac{v_{fy}}{v_i}\right) = \arctan\left(\dfrac{\sqrt{600 \cdot 9{,}81}}{400/3{,}6}\right) \cong \underline{\underline{34{,}6°}}$

Sous l'axe des x !

(d). Portée $= \Delta x = x_f = v_i \cdot \Delta t = \dfrac{400}{3{,}6} \cdot 7{,}82 \cong \underline{\underline{869 \text{ m}}}$

3.19



(a). Jusqu'au sommet P : selon y :

$$\Delta y = y_P = y_P = \frac{1}{2a_y}\left(v_{Py}^2 - v_{iy}^2\right)$$

$$11{,}0 = \frac{1}{2\cdot(-9{,}81)}\cdot\left(0 - v_{iy}^2\right) = \frac{v_{iy}^2}{2\cdot 9{,}81}$$

$$\Rightarrow v_{iy}^2 = 11{,}0\cdot 2\cdot 9{,}81$$

$$\Rightarrow v_{iy} = \sqrt{11{,}0\cdot 2\cdot 9{,}81} = v_i \sin\alpha = 62{,}0\cdot\sin\alpha$$

$$\Rightarrow \sin\alpha = \frac{v_{iy}}{62{,}0} \Rightarrow \alpha = \arcsin\left(\frac{\sqrt{11{,}0\cdot 2\cdot 9{,}81}}{62{,}0}\right) \cong \underline{\underline{13{,}7^\circ}}$$

(b). temps de vol Δt, selon y :

$$a_y = \frac{v_{Qy} - v_{iy}}{\Delta t} = \frac{-v_{iy} - v_{iy}}{\Delta t} \Rightarrow \Delta t = \frac{-2v_{iy}}{a_y}$$

en Q
$v_{Qy} = -v_{iy}$
(symétrie du mouvement)

$$\Delta t = \frac{-2\cdot\sqrt{11{,}0\cdot 2\cdot 9{,}81}}{-9{,}81} = \underline{\underline{3{,}00\,s}}$$

(c). Portée $= \Delta x = x_Q = v_{ix}\cdot\Delta t = 62{,}0\cdot\cos(13{,}7^\circ)\cdot 3{,}00 \cong \underline{\underline{180\,m}}$