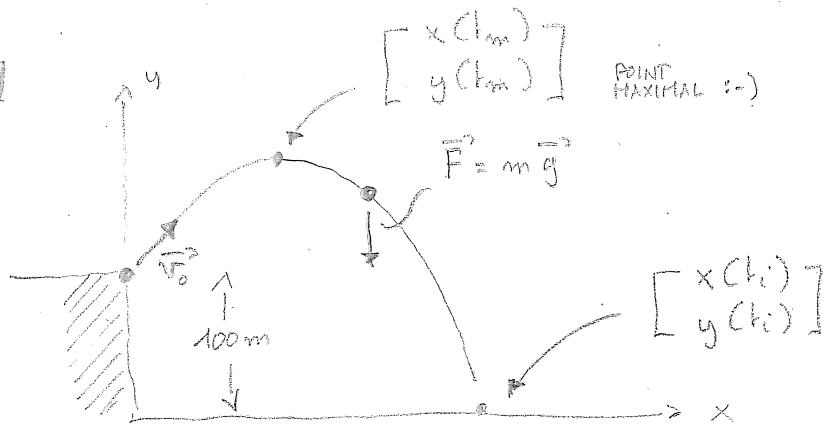


1



$$\begin{aligned} x(t) &= 0 + v_{x0}t \\ y(t) &= 100 + v_{y0}t - g\frac{t^2}{2} \end{aligned}$$

MRUA :-)

$$\begin{aligned} v_0 &= 25 \text{ m/s} \\ v_{y0} &= 25 \sin(53^\circ) = 20 \text{ m/s} \\ v_{x0} &= 25 \cos(53^\circ) = 15 \text{ m/s} \end{aligned}$$

$$\begin{aligned} 0 &= 100 + 20t - 4,9t^2 \\ 0 &= 4,9t^2 - 20t - 100 \\ t'_{\pm} &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \begin{cases} 6,9 \text{ [sec]} \\ -2,9 \text{ [sec]} \end{cases} \end{aligned}$$

à rejeter!

2  $t_m$  tel que  $\frac{dy}{dt}(t_m) = 0$

TEMPS  $t_i = 7 \text{ [sec]}$

$$\begin{aligned} 20 - g t_m &= 0 \\ t_m &= \frac{20}{9,81} = 2 \text{ [sec]} \end{aligned}$$

$$y(t_m) = 100 + \underbrace{20 \times 2}_{40} - \underbrace{9,81 \times \frac{4}{2}}_{20} = 120 \text{ [m]}$$

3

$$x(t_i) = 0 + 15 \times 7 = 105 \text{ [m]}$$

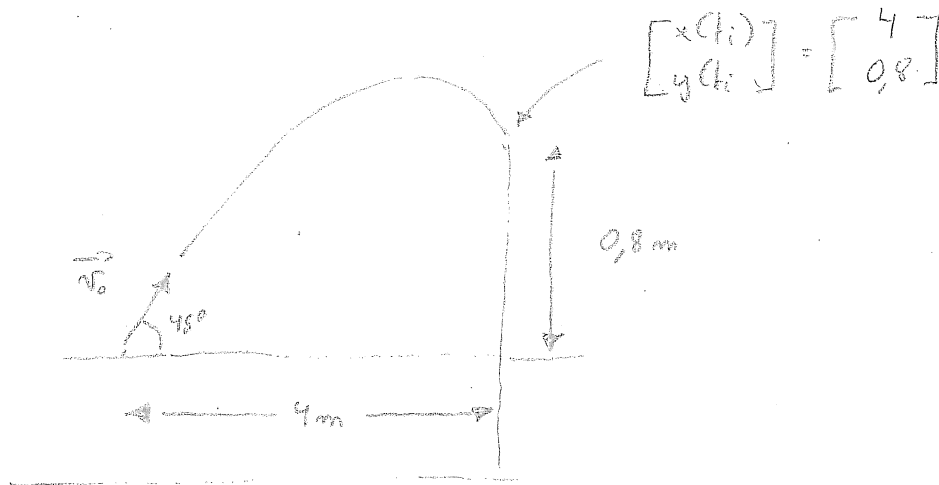
4

$$\begin{aligned} v_x(t_i) &= 15 \text{ [m/s]} \\ v_y(t_i) &= 20 - 9,81 \times 7 = -48,6 \text{ [m/s]} \end{aligned}$$

$$v(t_i) = \sqrt{15^2 + 48,6^2} \text{ [m/s]}$$

$\vec{v}(t_i)$

2



$$\begin{cases} x(t) = v_0 \cos(45^\circ) t \\ y(t) = v_0 \sin(45^\circ) t - g t^2 / 2 \end{cases} \quad \text{MRUA :-)}$$

$$\begin{cases} 4 = v_0 \cos(45^\circ) t_i \\ 0,8 = v_0 \sin(45^\circ) t_i - g t_i^2 / 2 \end{cases} \quad \begin{array}{l} t_i = \frac{4}{v_0 \cos(45^\circ)} \\ \text{2 EQUATIONS} \\ \text{2 INCONNUES OK!} \end{array}$$

$$0,8 = 4 \underbrace{\frac{\sin(45^\circ)}{\cos(45^\circ)}}_{=1} - g \frac{16}{v_0^2 \underbrace{\cos^2(45^\circ)}_{=1/2}} \frac{1}{2}$$

$1/2 = \frac{\sqrt{2}}{2} \frac{\sqrt{2}}{2} = \frac{2}{4} \text{ :-)}$

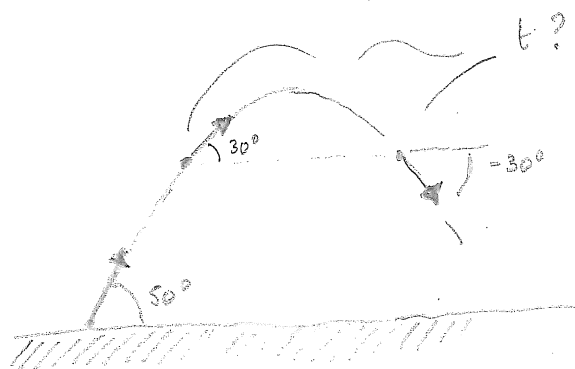
$$0,8 = 4 - \frac{9,81 \times 16}{v_0^2}$$

$$9,81 \times 16 = v_0^2 \underbrace{(4 - 0,8)}_{3,2}$$

$$49 = v_0^2$$

$$v_0 = 7 \text{ [m/s]}$$

3



$$\begin{aligned}
 x(t) &= \underbrace{25 \cos(50^\circ)}_{16,07} t \\
 y(t) &= \underbrace{25 \sin(50^\circ)}_{19,15} t - \frac{9,81 t^2}{2}
 \end{aligned}$$

MRUA :-)

$$v_x(t) = 16,07$$

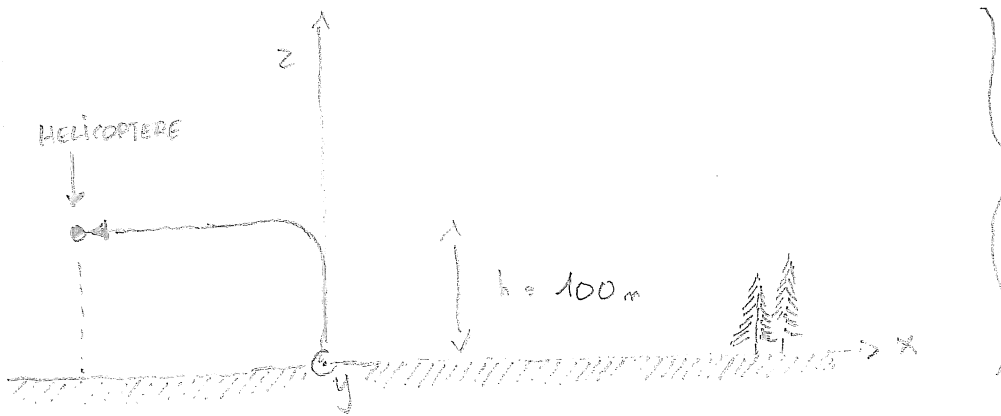
$$v_y(t) = 19,15 - 9,81 t$$

$$\underbrace{\tan(\pm 30^\circ)}_{\pm 1/\sqrt{3}} = \frac{19,15 - 9,81 t}{16,07} = \frac{v_y(t)}{v_x(t)} \quad !$$

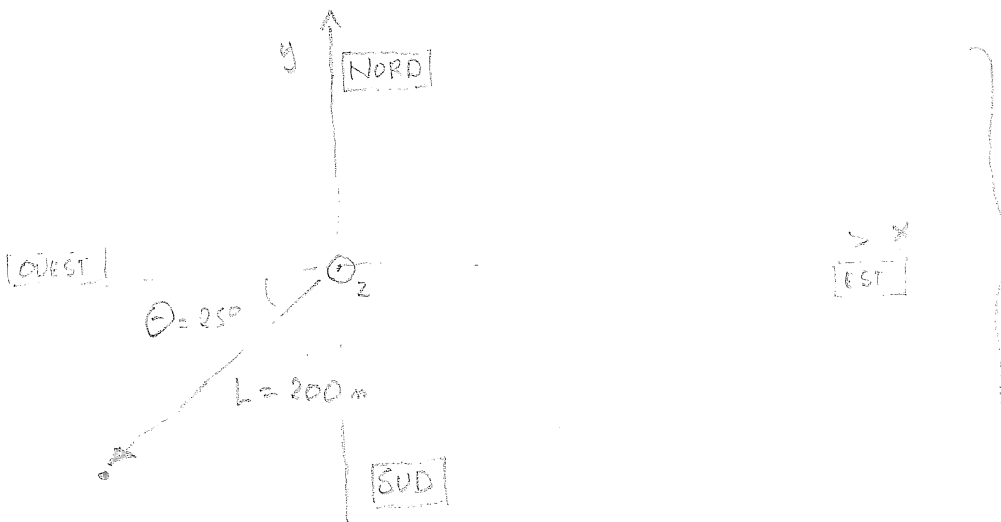
$$\underbrace{\pm \frac{16,07}{\sqrt{3}} + 19,15}_{\pm 9,28} = 9,81 t$$

$$t = \begin{cases} 2,9 \text{ [sec]} \\ 1,0 \text{ [sec]} \end{cases}$$

4



VUE  
EN  
COUPE !



VUE  
DU  
DESSUS !

$$\vec{x} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -L \cos \theta \\ -L \sin \theta \\ h \end{bmatrix}$$

$$\vec{d} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} -L \cos \theta \\ -L \sin \theta \\ h \end{bmatrix} = \begin{bmatrix} -200 \cos(25^\circ) \\ -200 \sin(25^\circ) \\ 100 \end{bmatrix}$$

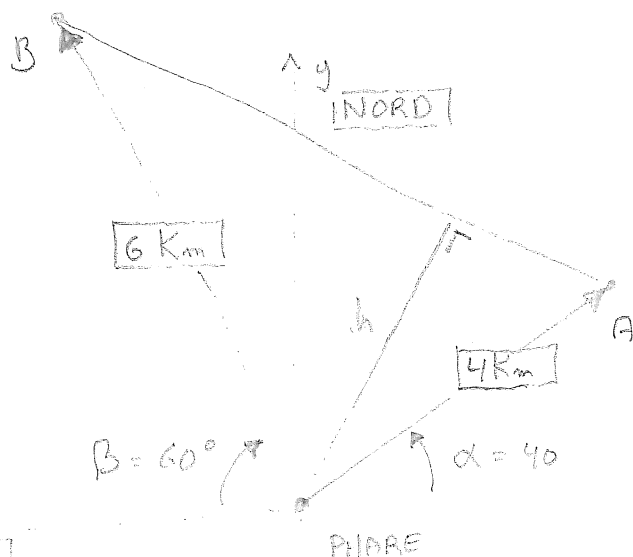
DEPLACEMENT

VECTEUR  
DEPLACEMENT

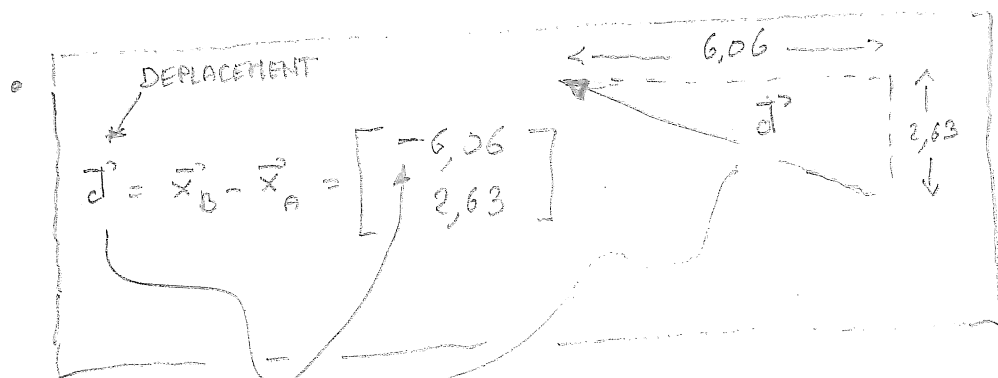
$$\begin{bmatrix} -181,26 \\ -84,5 \\ 100 \end{bmatrix} = \vec{d}$$

5

$$\begin{bmatrix} -6 \cos(60) \\ 6 \sin(60) \end{bmatrix} = \begin{bmatrix} 6 \cos(120) \\ 6 \sin(120) \end{bmatrix} = \begin{bmatrix} -3 \\ 5,2 \end{bmatrix} = \vec{x}_B$$



$$\begin{bmatrix} 4 \cos(40^\circ) \\ 4 \sin(40^\circ) \end{bmatrix} = \begin{bmatrix} 3,06 \\ 2,57 \end{bmatrix} = \vec{x}_A$$



$$\vec{d} = \vec{x}_B - \vec{x}_A = \begin{bmatrix} -6,06 \\ 2,63 \end{bmatrix}$$

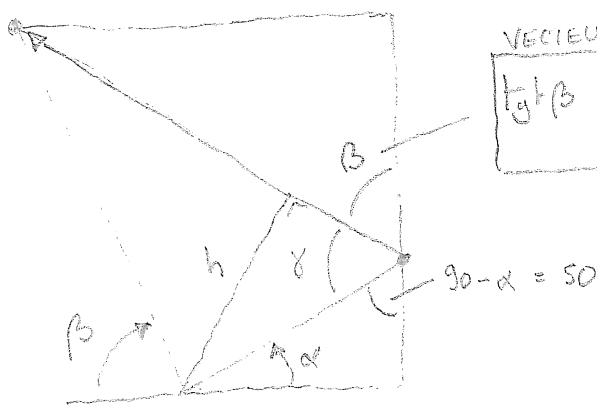
SIGNE NEGATIF car DIRIGE VERS L'OUEST !

(\*\*\*)  
↑  
DIFFICILE !

UN PEU DE TRIGONOMETRIE

TRICKY !

C'EST VRAIMENT PLUS COMPLIQUE QUE CE QUI EST EXIGE !



$$h = 3,58 \text{ Km}$$

VECTEUR  $\vec{d}$

$$\tan \beta = \frac{6,06}{2,63} \Rightarrow \beta = 66,5^\circ$$

$$\gamma = 180 - 66,5^\circ - 50^\circ = 63,5^\circ$$

$$h = 4 \sin(\gamma) = 4 \sin(63,5) = 3,58$$