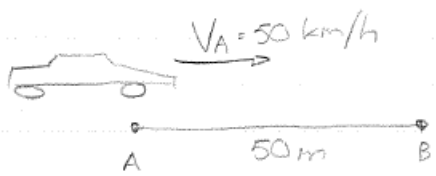
PROBLÈME 11.36



$a_A = 3\ m/s^2$ = constante

$V_A = 50\ km/h = 13.89\ m/s$

a) $t_{AB} = ?$ $\quad x = x_0 + V_0 t + \frac{1}{2} a t^2$

$50 = 0 + 13.89 \cdot t + 1.5 t^2$

$\therefore 1.5t^2 + 13.89t - 50 = 0$ $\quad ax^2 + bx + c = 0$

Zéros d'une équation quadratique : $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\boxed{t = 2.77\ sec}$ ou ~~$t = -12.03\ sec$~~

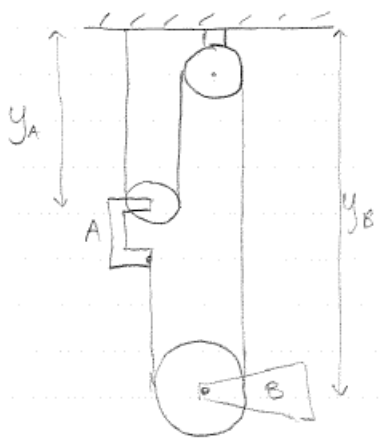
b) $V_B = ?$

$V_B^2 = V_A^2 + 2a(x - x_0)$

$= 13.89^2 + 2 \cdot 3 \cdot 50$

$\boxed{V_B = 22.2\ m/s = 79.9\ km/h}$

Problème 11.51



Longueur du câble = constante

$2y_A + y_B + (y_B - y_A) = \text{const.}$

$y_A + 2y_B = \text{const.}$

$\frac{d(\ )}{dt} \Rightarrow V_A + 2V_B = 0 \quad \therefore V_A = -2V_B$

$\frac{d(\ )}{dt} \Rightarrow a_A + 2a_B = 0 \quad \therefore a_A = -2a_B$

a) Trouver a_A et a_B

a_A = constante $\Rightarrow$ $v_A = \cancel{v_{0A}}^{\text{initialement au repos.}} + a_A t$

Quand $t = 8s$ $\quad v_{B/A} = 0.6 m/s = v_B - v_A$

$= v_B - (-2v_B) = 3v_B$

$v_B = 0.2 m/s$

$v_A = -2v_B = -0.4 m/s$

$v_A = a_A \cdot t \Rightarrow a_A = \frac{v_A}{t} = \frac{-0.4}{8} = -0.05 \Rightarrow \boxed{a_A = 0.05 m/s^2 \uparrow}$

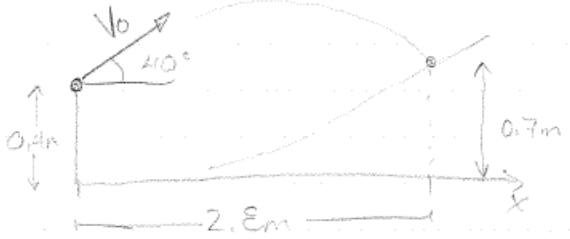
$a_B = -\frac{a_A}{2} \Rightarrow \boxed{a_B = 0.025 m/s^2 \downarrow}$

b) Après 6s : $x_B = \cancel{x_0}^{0} + \cancel{v_{0B}}^{0} t + \frac{1}{2} a_B t^2$

$x_B = \frac{1}{2} a_B t^2 \Rightarrow \boxed{x_B = 0.45 m \downarrow}$

$v_B = \cancel{v_{0B}}^{0} + a t \Rightarrow \boxed{v_B = 0.15 m/s \downarrow}$

Problème 11.105



Trouver v_0.

Selon x : mouvement uniforme ($a_x = 0$, $v_x = const$)

$v_x = v_{0x} = v_0 \cos 40$

$x = \cancel{x_0}^{0} + v_{0x} t \Rightarrow 2.8 = v_0 \cos 40 \cdot t$ [EQ 1]

$t = 2.8 / v_0 \cos 40$

Selon y : accélération uniforme : $a_y = -9.81 m/s^2 = const.$

$y = y_0 + v_{0y} \cdot t + \frac{1}{2} a_y t^2$

$$0.7 = 0.4 + V_0 \sin 40 \cdot t - 4.905 t^2$$

Sub [EQ 1] $\Rightarrow$ $$0.3 = V_0 \sin 40 \cdot \frac{2.8}{V_0 \cos 40} - 4.905 \left(\frac{2.8}{V_0 \cos 40} \right)^2$$

$$0.3 = 2.349 - \frac{65.531}{V_0^2}$$

$$\Rightarrow V_0 = \sqrt{\frac{-65.531}{-2.049}} \Rightarrow \boxed{V_0 = 5.655 \text{ m/s}}$$