(a) Accélération nulle.

(b) (S) ?

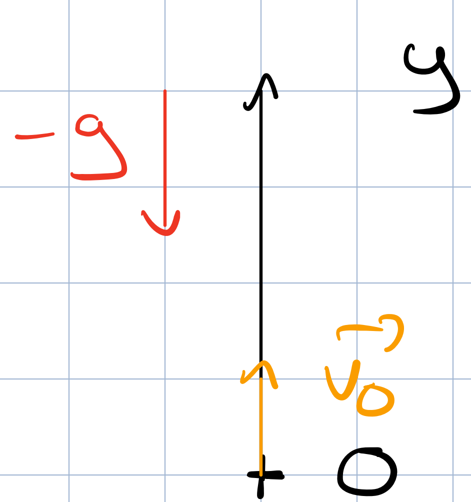
(1) Saut du saumon

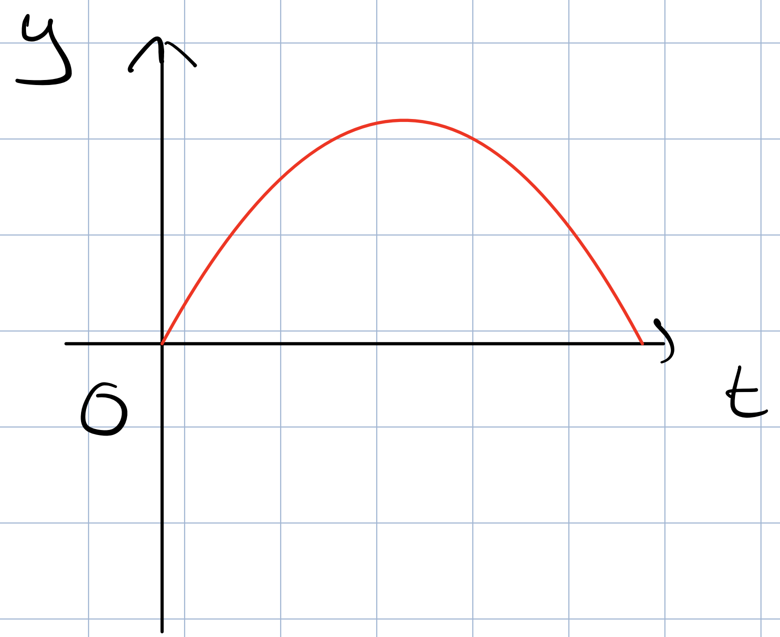
(a)

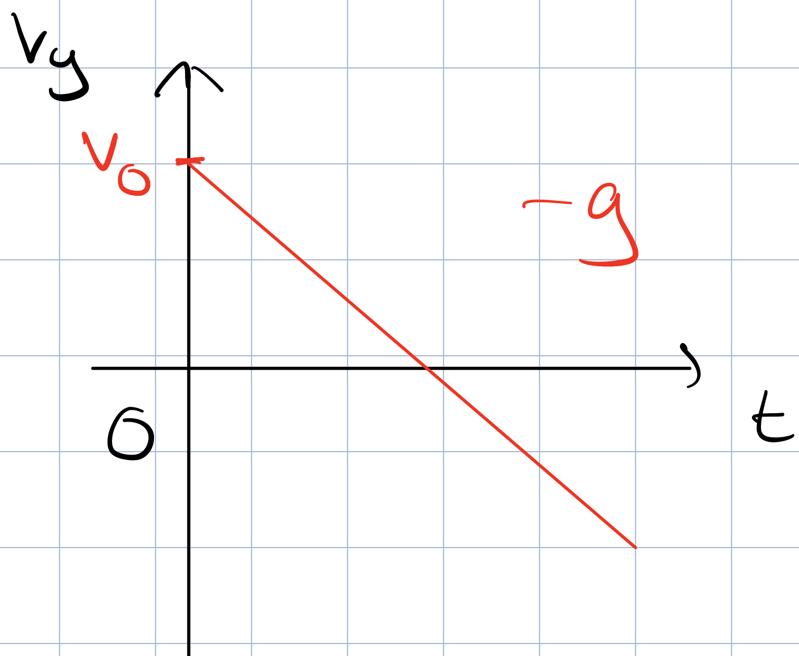
$$\ddot{x} = a$$
$$\dot{x} = at + \dot{x}(0)$$
$$x = \frac{1}{2}at^2 + \dot{x}(0)t + x(0)$$

V_0 vitesse initiale
x_0 position initiale

(b)







(c) $y(t) = -\frac{1}{2} g t^2 + v_0 t + y_0$

$\max(\alpha ; \beta) \quad \alpha = \frac{-b}{2a} = \frac{-v_0}{-5}$

$= 3/5$

$$x = \frac{-3}{-10} = \frac{3}{10}$$

$$y\left(\frac{3}{10}\right) = -\frac{1}{2}(10)\left(\frac{3}{10}\right)^2 + 3\left(\frac{3}{10}\right)$$

$$= -5\left(\frac{9}{100}\right) + \frac{9}{10}$$

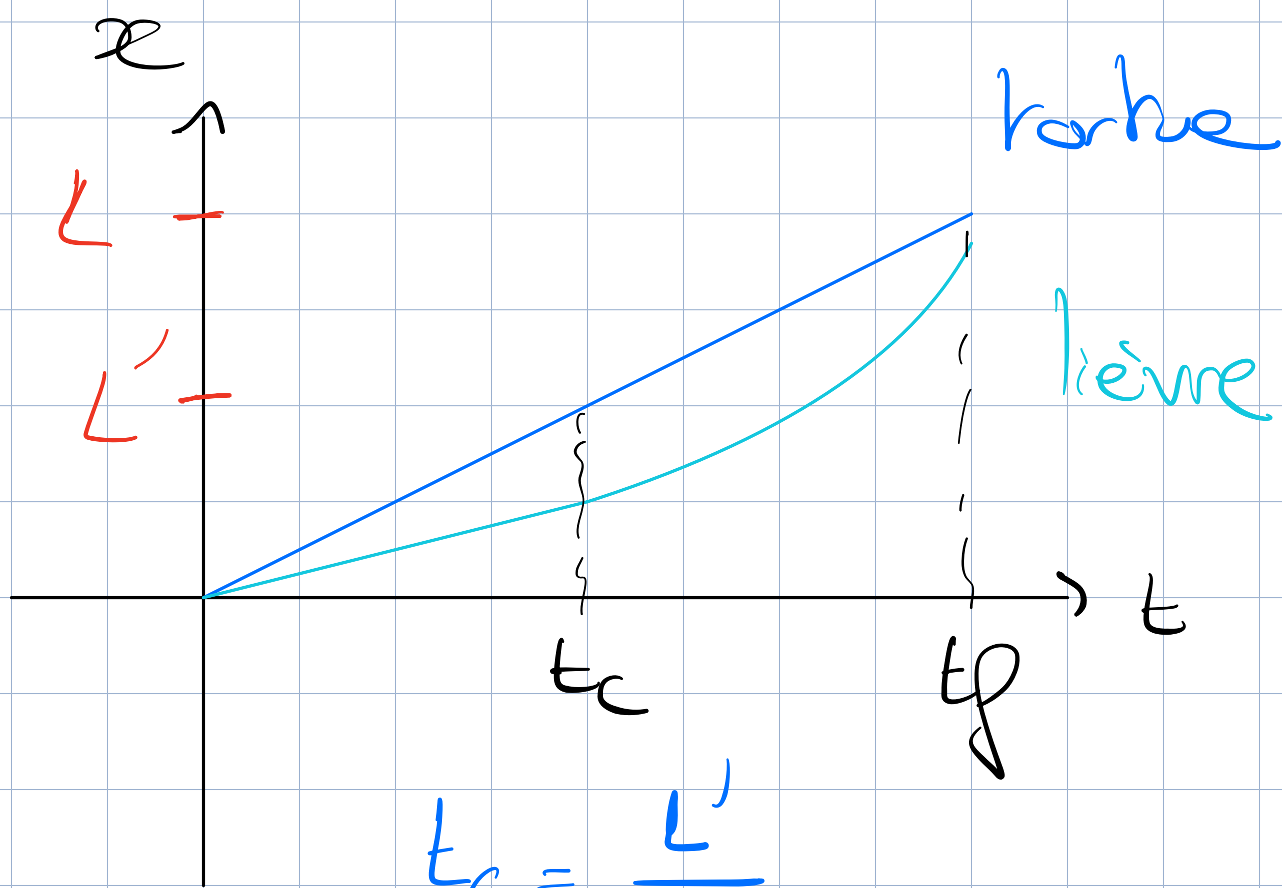
$$= \frac{-45}{100} + \frac{9}{10}$$

$$= \frac{45}{100}$$

$$= \underline{0{,}45\,m}$$

Ex2

(a)



$$t_c = \frac{L'}{V_t}$$

(b)

$$x_t(t) = v_t \times t$$

$$x_l(t) = \begin{cases} V_l \times t, & \text{si } t \leq t_c \\ V_l \times t + \frac{1}{2} a (t - t_c)^2, & \text{si } t > t_c \end{cases}$$

$$\frac{1}{2}a(t_f-t_c)^2+V_\ell\times t_f$$

$$\geqslant V_t\times t_f$$

$$\Leftrightarrow \frac{1}{2}a(t_f-t_c)^2 \geqslant (V_t-V_\ell)\times t_f$$

$$\Leftrightarrow a \geqslant \frac{2(V_t-V_\ell)t_f}{(t_f-t_c)^2} \quad t_1$$

c

$$\frac{m}{s^2} = m\cdot s^{-2} \quad \boxed{\text{Ok}}$$

Si $V_t = V_f$, $a=0$

Si $t_c \to t_f$, $a \to +\infty$

Si $t_f \gg t_c$, $a \to 0$

$$V_\ell \times t_c + \frac{1}{2} a (tf - t_c)$$

$$\frac{1}{2} a (tf - t_c) > (v_t - v_\ell) tf$$

avance de la tache jusqu'au point L

$$\Delta d = \underbrace{(v_t - v_\ell) \times t_f}_{\text{distance (m)}}$$

t auquel la tache arrive au point L'

$$(L - L') = v_t \times t_t$$

$$\Leftrightarrow t = \frac{L - L'}{v_t}$$

$$\Delta d_2 = (V_t - V_\ell) \times \left(\frac{L}{V_t}\right) - \frac{1}{2} a \left(\frac{L - L'}{V_t}\right) \leq 0 \text{ m}$$

$$\Leftrightarrow 2(V_t - V_\ell) \times \frac{L}{V_t} \left(\frac{L - L'}{V_t}\right)^{-2} \leq a$$

3

a) • Référentiel terrestre supposé inertiel.

• $(O, \vec{x}, \vec{y})$

$$\sum \vec{F} = m\vec{a}$$

$$\Leftrightarrow \vec{P} = m\vec{a}$$

$$\vec{a} \begin{cases} a_y(t) = -g \\ a_x(t) = 0 \end{cases}$$

$$\vec{v} \begin{cases} v_y(t) = -gt + \sin\alpha V_0 \\ v_x(t) = \cos\alpha V_0 \end{cases}$$

$$\vec{OM} \begin{cases} y_r(t) = -\frac{1}{2}gt^2 + \sin\alpha V_0 t \\ x_r(t) = \cos\alpha V_0 t \end{cases}$$

$$\sum \vec{F} = m\vec{a}$$

$$\Leftrightarrow \vec{P} = m\vec{a}$$

$$\vec{a} \begin{cases} a_y(t) = -g \\ a_x(t) = 0 \end{cases}$$

$$\vec{v} \begin{cases} v_y(t) = -gt \\ v_x(t) = 0 \end{cases}$$

$$\vec{OM} \begin{cases} y_f(t) = -\frac{1}{2}gt^2 + H \\ x(t) = L \end{cases}$$

$$\begin{cases} \cos\alpha \, V_0 t = L \\ -\frac{1}{2}gt^2 + \sin\alpha \, V_0 t = H - \frac{1}{2}gt^2 \end{cases}$$

$$\begin{cases} \cos(\alpha) V_0 t = L \\ \sin(\alpha) V_0 t = H \end{cases}$$

$$\Leftrightarrow \begin{cases} \cos\alpha V_0 t = L \\ t = \dfrac{H}{\sin(\alpha) V_0} \end{cases}$$

$$\Leftrightarrow \begin{cases} \cos\alpha V_0 \dfrac{H}{\sin\alpha V_0} = L \\ t = \dfrac{H}{\sin\alpha V_0} \end{cases}$$

$$\Leftrightarrow \begin{cases} \dfrac{\cos\alpha}{\sin\alpha} H = L \\ t = \dfrac{H}{\sin\alpha V_0} \end{cases}$$

$$\Leftrightarrow \begin{cases} \dfrac{H}{L} = \tan\alpha \\ t = \dfrac{H}{\sin\alpha V_0} \quad \dfrac{\sqrt{H^2+L^2}}{V_0} \end{cases}$$

$$y_{fromage}(t) = H - \frac{1}{2} g t^2$$

$$= H - \frac{1}{2} g \frac{H^2}{\sin^2(\alpha) V_0^2}$$

$y_f \geq 0$

$$\Leftrightarrow \quad H - \frac{1}{2} g \frac{H^2}{\sin^2(\alpha) V_0^2} \geq 0$$

$$\Leftrightarrow \quad \frac{2H \sin^2(\alpha)}{g H^2} \leq \frac{1}{V_0^2}$$

$$\Leftrightarrow \quad V_0 \geq \sqrt{\frac{gH}{2 \sin^2(\alpha)}}$$

$$\sin\alpha = \frac{\text{opp}}{\text{hyp}} = \frac{H}{\sqrt{H^2+L^2}}$$

$$\sqrt{\frac{gH}{2\left(\frac{H^2}{H^2+L^2}\right)}}$$

$$= \sqrt{\frac{gH(H^2+L^2)}{2H^2}}$$

$$= \sqrt{\frac{gH^3+gHL^2}{2H^2}}$$

$$= \sqrt{\frac{gH^2+gL^2}{2H}}$$

$$= \sqrt{\frac{g(H^2+L^2)}{2H}}$$

$$\Leftrightarrow \begin{cases} \cos\alpha V_0 t = L \\ \sin\alpha V_0 t = H \end{cases}$$

$$\Leftrightarrow \begin{cases} t = \dfrac{L}{\cos\alpha V_0} \\ t = \dfrac{H}{\sin\alpha V_0} \end{cases}$$

$$\Leftrightarrow \frac{L}{\cos\alpha \cancel{V_0}} = \frac{H}{\sin\alpha \cancel{V_0}}$$

$$\Leftrightarrow L\sin\alpha = H\cos\alpha.$$

$$\Leftrightarrow L\tan\alpha = H$$

$$\Leftrightarrow \tan\alpha = \frac{H}{L}$$

$$\Leftrightarrow \alpha = \arctan \frac{H}{}$$

(b) $y(t) = H - \frac{1}{2} g \left(\arctan\left(\frac{H}{L} \right) \right) > 0$