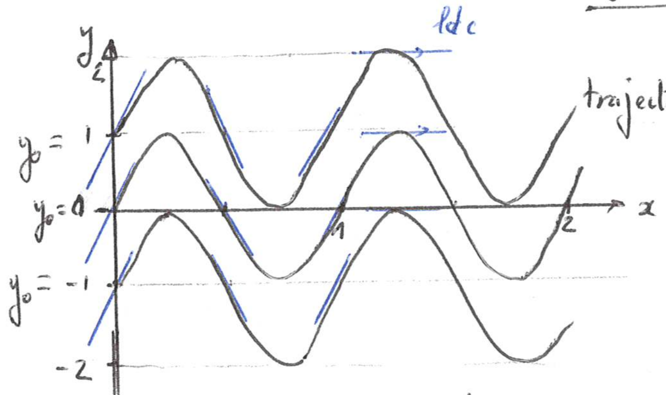
MF 202 Ecoulement ondulant

1 - a) $\vec{v} = \begin{vmatrix} \frac{dx}{dt} = b \\ \frac{dy}{dt} = a\cos(\omega t) \end{vmatrix} \xrightarrow{\int} \vec{R} = \vec{R}_0 + \int_0^t \vec{v}(t) = \begin{vmatrix} x_0 \\ y_0 \end{vmatrix} + \begin{vmatrix} bt \\ \frac{a}{\omega}\sin(\omega t) \end{vmatrix}$

$t = \frac{x - x_0}{b}$

$\hookrightarrow \underline{y - y_0 = \frac{a}{\omega}\sin\left(\frac{\omega}{b}(x - x_0)\right)} \overset{AN}{=} \sin(2\pi(x - x_0))$



b) $\vec{a} = \frac{d\vec{V}(t)}{dt} = \begin{vmatrix} 0 \\ -a\omega\sin(\omega t) \end{vmatrix}$

En formalisme eulerien ; $t = \frac{x}{b}$

$\rightarrow \vec{v} = \begin{vmatrix} b \\ a\cos\left(\frac{\omega}{b}x\right) \end{vmatrix}$

2a) $\frac{dx}{v_x} = \frac{dy}{v_y} \rightarrow \frac{dx}{b} = \frac{dy}{a\cos\left(\frac{\omega}{b}x\right)} \rightarrow \frac{dx}{b} a\cos\left(\frac{\omega}{b}x\right) = dy \xrightarrow{\int} \underline{\frac{a}{\omega}\left(\sin\left(\frac{\omega x}{b}\right) - \sin\left(\frac{\omega x_0}{b}\right)\right) = y - y_0}$

$\left(\frac{dx}{b} = \frac{dy}{a\cos(\omega t)} \xrightarrow{\int} \frac{x - x_0}{b} = \frac{y - y_0}{a\cos(\omega t)} \rightarrow y - y_0 = x \times \frac{a}{b}\cos(\omega t)\right)$: dtes // de même pente à t fixé

b) $\vec{a} = \frac{\partial \vec{v}}{\partial t} + (\vec{v}.\vec{grad})\vec{v} = \begin{vmatrix} 0 \\ -a\omega\sin(\omega t) \end{vmatrix} + \begin{vmatrix} 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 0 \\ -a\omega\sin(\omega t) \end{vmatrix}$

3) $\operatorname{div}\vec{v} = \frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z} = 0$