EX P CIN

$\boxed{2}$

$$\vec{a} = (\ddot{r} - r\dot{\theta}^2)\,\vec{u_r} + (2\dot{r}\dot{\theta} + r\ddot{\theta})\,\vec{u_\theta} + \cancel{\ddot{z}\vec{u_z}}$$

$\forall t \quad a_\theta = 0 = 2\dot{r}\dot{\theta} + r\ddot{\theta} = \frac{1}{r}\frac{d}{dt}(r^2\dot{\theta})$

(à $t=0$)

$r^2\dot{\theta} = \text{const} = r_0^2\dot{\theta}_0$

$$\dot{\theta}(t) = \frac{r_0^2}{r^2}\dot{\theta}_0$$

$\boxed{5/1}$

$$r(\theta) = r_0 \sin\theta$$

avec : $\omega = \dot{\theta} = \text{const} \Leftrightarrow \theta(t) = \omega t + C$

CI $\theta(0) = 0 = 0 + C$

$$\begin{cases} \theta(t) = \omega t \\ r(t) = r_0 \sin(\omega t) \end{cases}$$

$$\vec{v} = \dot{\vec{OM}} = \frac{d}{dt}(r\vec{u_r}) = \dot{r}\vec{u_r} + r\dot{\theta}\vec{u_\theta}$$

$$= r_0\omega\cos(\omega t)\,\vec{u_r} + r_0\sin(\omega t)\,\omega\,\vec{u_\theta}$$

$$= r_0\omega\left(\cos(\omega t)\,\vec{u_r} + \sin(\omega t)\,\vec{u_\theta}\right)$$

Meth 1

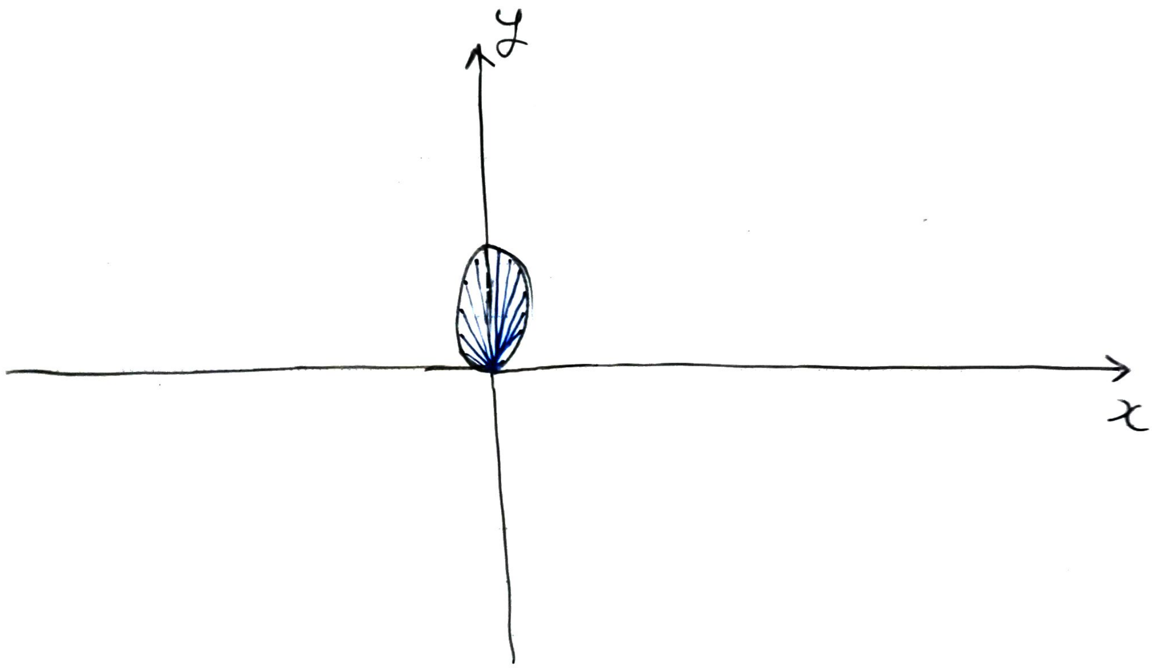
$$\vec{a} = \dot{\vec{v}} = (\ddot{r} - r\dot{\theta}^2)\,\vec{u_r} + (2\dot{r}\dot{\theta} + r\ddot{\theta})\,\vec{u_\theta}$$

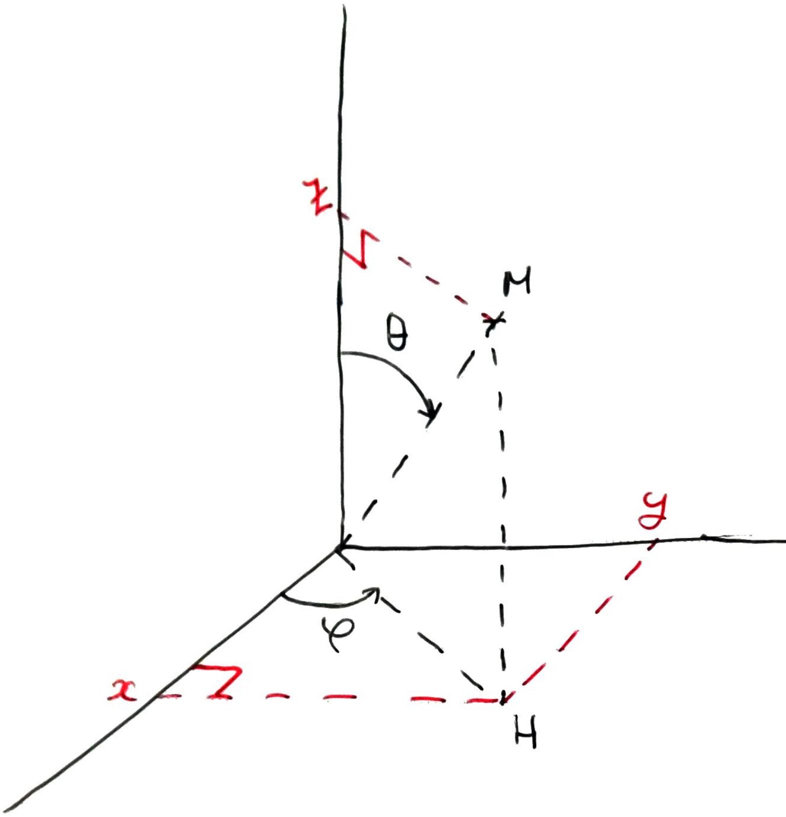
Meth 2

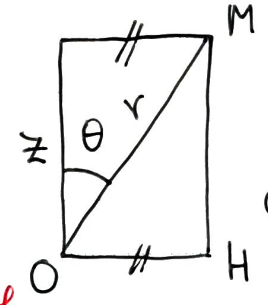
$$\vec{a} = \frac{d}{dt}\left(r_0\omega \left(\cos(\omega t)\,\vec{u_r} + \sin(\omega t)\,\vec{u_\theta}\right)\right)$$

$\boxed{5/2}$

$$\|\vec{v}\| = r_0\omega\sqrt{C^2 + S^2} = r_0\omega \doteq 0 \Rightarrow \text{Mv } \underline{\text{uniforme}}$$



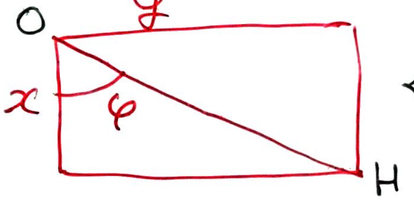




alors

$z = r\cos\theta$

$OH = r\sin\theta$



$$\begin{cases} x = OH\cos\varphi \\ \quad = r\sin\theta\cos\varphi \\ y = OH\sin\varphi \\ \quad = r\sin\theta\sin\varphi \end{cases}$$

$$\begin{cases} x = r\sin\theta\cos\varphi \\ y = r\sin\theta\sin\varphi \\ z = r\cos\theta \end{cases}$$

$$OM = \|\overrightarrow{OM}\| = \sqrt{x^2+y^2+z^2}$$

$$= r$$

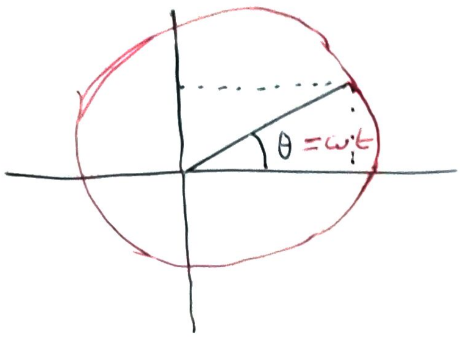
EXPCIN

4/1

$$\begin{cases} x(t) = r\cos(\omega t) \\ y(t) = r\sin(\omega t) \\ z(t) = \alpha t \end{cases}$$

$\dot{z}(t) = \alpha = \text{const} \quad \forall t \quad \Rightarrow$ TRU

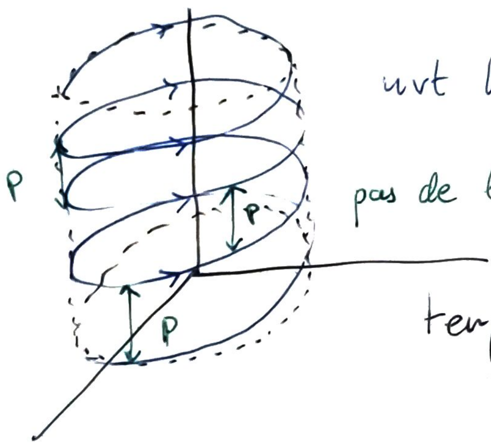
équations de x et y



MC (O, r, vit. angulaire $\omega = \dot{\theta} = \text{const}$)

$\omega = \dot{\theta} = \text{const}$

MCU



mvt hélicoidal

pas de l'hélice

temps pour faire un tour : $T = \frac{2\pi}{\omega}$

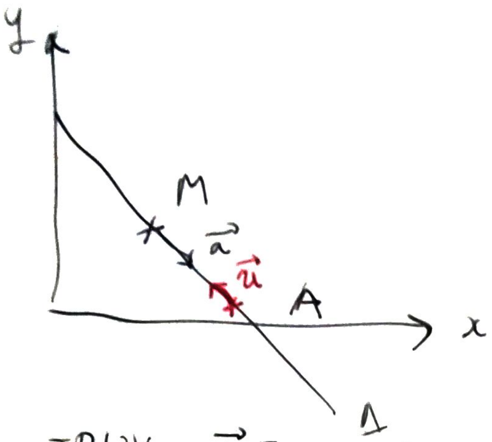
$$\boxed{p = \alpha \frac{2\pi}{\omega}}$$

$z(t+T) = z(t) + p$

4/2

$\|\vec{v}\| = \sqrt{\dot{x}^2 + \dot{y}^2 + \dot{z}^2} = \sqrt{r^2\omega^2 + \alpha^2} \Rightarrow$ mouvement uniforme car $\|\vec{v}\| = \text{const}$

3/1



TRUV $\quad \vec{a} = -a\vec{u}$

$$\vec{v} = \dot{\vec{OM}} = \cancel{\dot{\vec{OA}}} + \dot{\vec{AM}}$$

3/2

On projette.

$$v = \dot{AM}$$

$\vec{a} = \dot{\vec{v}}$ On projette (sur $\vec{u}$)

$$-a = \dot{v}$$

$$v = -at + const$$

$$v(0) = v_0$$

$$\boxed{v(t) = v_0 - at} = \dot{AM}$$

$$AM = v_0 t - a\frac{t^2}{2} + const$$

$$AM(0) = AA = 0 = 0 + 0 + const$$

alors const $= 0$

$$\boxed{AM = v_0 t - \frac{1}{2}at^2}$$

$\exists t \,/\, AB = v_0 t - \frac{1}{2} a t^2$

$$-\frac{1}{2} a t^2 + v_0 t - \sqrt{2} D = 0$$

ait une solution!

$$\Delta = v_0^2 - 2\sqrt{2}\, a D \geqslant 0$$

$$\boxed{v_0 \geqslant \sqrt{2\sqrt{2}\, a D}}$$