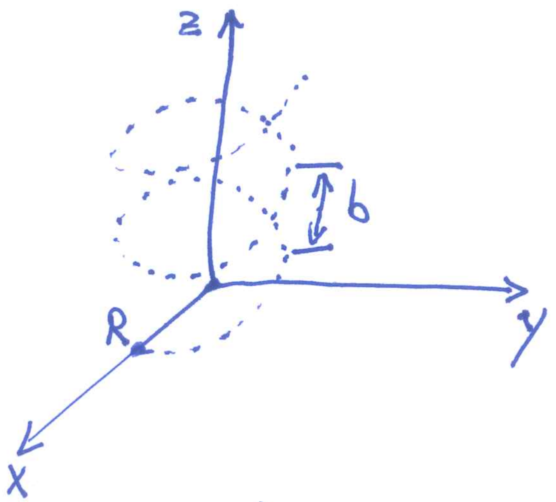
Clase 4 : FIS 1513

Ejemplo Coordenadas cilíndricas:

Datos: $V = V_0$ constante

Equ. de la hélice:

$$\rho = R \quad ; \quad \left.\begin{array}{l} 2\pi - b \\ \theta - z \end{array}\right\} \theta = \left(\frac{2\pi}{b}\right) z$$



$$\vec{r}(t) = R\hat{\rho} + z\hat{k}$$

$$\vec{v}(t) = \frac{d\vec{r}}{dt} = R\dot{\theta}\hat{\theta} + \dot{z}\hat{k}$$

como $V =$ cte.

$$\Rightarrow |\vec{V}| = V_0 = \sqrt{(R\dot{\theta})^2 + \dot{z}^2}$$

y $\dot{z} = \left(\frac{b}{2\pi}\right)\dot{\theta}$

obtenemos: $V_0 = \sqrt{R^2 + \left(\frac{b}{2\pi}\right)^2}\,\dot{\theta}$

y $\dot{\theta} = \frac{V_0}{\sqrt{R^2 + (b/2\pi)^2}}$ (cte.)

y

$$\vec{V} = \left[R\hat{\theta} + \left(\frac{b}{2\pi}\right)\hat{k}\right]\dot{\theta}$$

$$\vec{V} = \left[\hat{\theta} + \frac{b}{2\pi R}\hat{k}\right] \cdot \frac{V_0}{\sqrt{R^2 + (b/2\pi)^2}}$$

$$\vec{V} = \left[\text{—— " ——}\right] \cdot \frac{V_0}{\sqrt{1 + \left(\frac{b}{2\pi R}\right)^2}}$$

$$\vec{a} = \frac{d\vec{v}}{dt} = -R\dot{\theta}^2\hat{\rho} + \underbrace{\ddot{z}}_{0}\hat{k}$$

$$\vec{a} = \frac{-R V_0^2}{R^2 + (b/2\pi)^2}\hat{\rho}$$

$$\vec{a} = \frac{-V_0^2}{R\left(1 + (b/2\pi R)^2\right)}\hat{\rho}$$

Notamos que cdo. $b = 0$ el movim. se reduce al mov. circular uniforme.