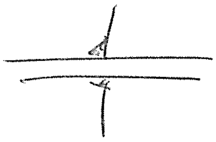
Correction DS de SI, PCSI 1, janvier 06

Questions de cours

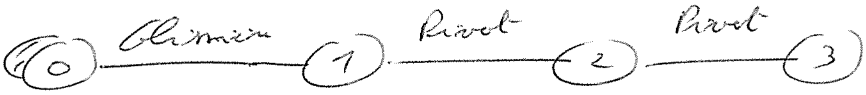
1) appui plan. 

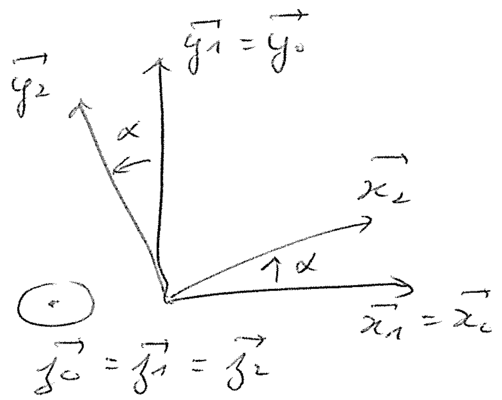
2T, 1R

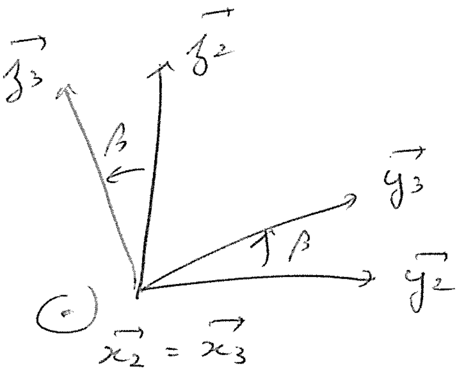
2) rotule 

3R

Exo 1 Atterrisseur auxiliaire

1) 

2) 



3) $\vec{v}(A \in 3/0) = \left(\dfrac{d\vec{O_0A}}{dt}\right)_0$

$$\vec{O_0A} = y\,\vec{y_0} + a\,\vec{z_0} - L\,\vec{y_2} + R\,\vec{y_3}$$

$$\left(\frac{d\vec{y_3}}{dt}\right)_0 = \left(\frac{d\vec{y_3}}{dt}\right)_2 + \vec{\Omega}_{2/0} \wedge \vec{y_3} = \dot{\beta}\,\vec{z_3} + \dot{\alpha}\,\vec{z_2} \wedge (\cos\beta\,\vec{y_2} + \sin\beta\,\vec{z_2})$$

$$\left(\frac{d\vec{y_3}}{dt}\right)_0 = \dot{\beta}\,\vec{z_3} - \dot{\alpha}\cos\beta\,\vec{x_2} \quad (\times R)$$

$$\vec{v}(A \in 3/0) = \dot{y}\,\vec{y_0} + L\dot{\alpha}\,\vec{x_2} + R\dot{\beta}\,\vec{z_3} - R\dot{\alpha}\cos\beta\,\vec{x_2}$$

4) $\vec{v}(A \in 3/0) = \underbrace{\vec{v}(O_3 \in 3/0)} + \vec{\Omega}_{3/0} \wedge \vec{O_3A}$

$$\vec{v}(O_3 \in 3/0) = \underbrace{\vec{v}(O_3 \in 3/2)}_{\vec{0}} + \underbrace{\vec{v}(O_3 \in 2/0)}$$

$$\vec{v}(O_3 \in 2/0) = \underbrace{\vec{v}(O_2 \in 2/0)} + \vec{\Omega}_{2/0} \wedge \vec{O_2O_3}$$

$$\vec{v}(O_2 \in 2/0) = \underbrace{\vec{v}(O_2 \in 2/1)}_{\vec{0}} + \underbrace{\vec{v}(O_2 \in 1/0)}_{\dot{y}\,\vec{y_0}}$$

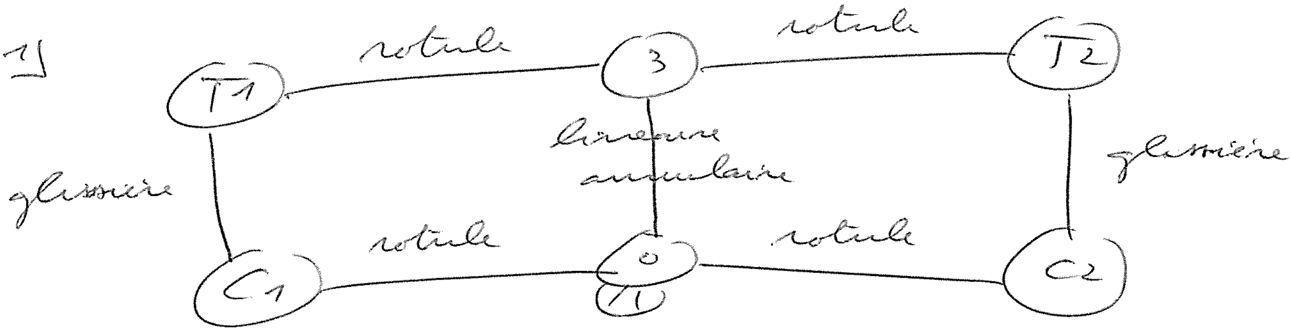
② 5] $\left(\frac{d\vec{z_3}}{dt}\right)_0 = \left(\frac{d\vec{z_3}}{dt}\right)_2 + \vec{\Omega^2_0} \wedge \vec{z_3}$

$= -\dot{\beta}\,\vec{y_3} + \dot{\alpha}\,\vec{z_2} \wedge (-\sin\beta\,\vec{y_2} + \cos\beta\,\vec{z_2})$

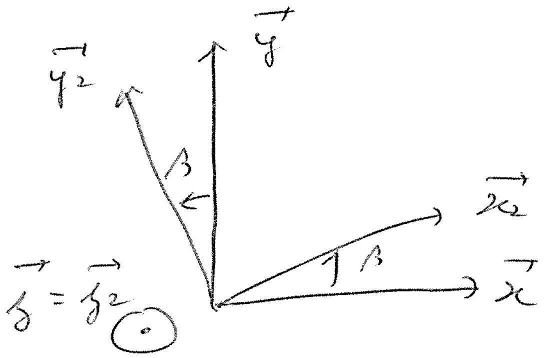
$= -\dot{\beta}\,\vec{y_3} + \dot{\alpha}\sin\beta\,\vec{x_2}$

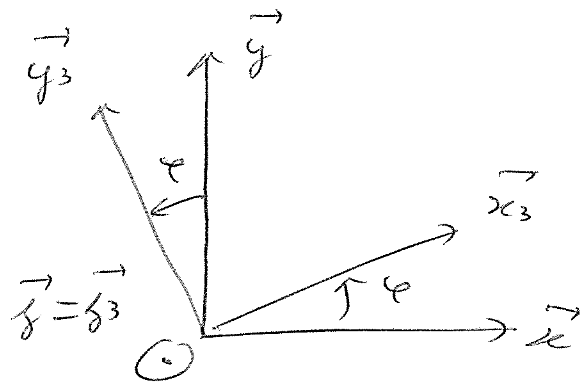
Exo 2 Exosquelette lombaire

1]



2]





3] $\vec{OC} + \vec{CD} = \vec{OE} + \vec{ED} \Rightarrow h\vec{y} + b\vec{x_3} = a\vec{x} + l\vec{y_2}$

$\begin{cases} \vec{x_3} = \cos\varphi\,\vec{x} + \sin\varphi\,\vec{y} \\ \vec{y_2} = -\sin\beta\,\vec{x} + \cos\beta\,\vec{y} \end{cases} \Rightarrow \begin{cases} b\cos\varphi = a - l\sin\beta \\ h + b\sin\varphi = l\cos\beta \end{cases}$

$\Rightarrow \begin{cases} l\sin\beta = a - b\cos\varphi \\ l\cos\beta = h + b\sin\varphi \end{cases}$

$l = \sqrt{(a - b\cos\varphi)^2 + (h + b\sin\varphi)^2}$

4] Avec $h = 100$ et $\varphi = 0$ $\Rightarrow l_{min} = 111,8$ mm

Avec $h = 150$ et $\varphi = 20°$ $\Rightarrow l_{max} = 205,4$ mm

$\Delta l = 93,6$ mm