

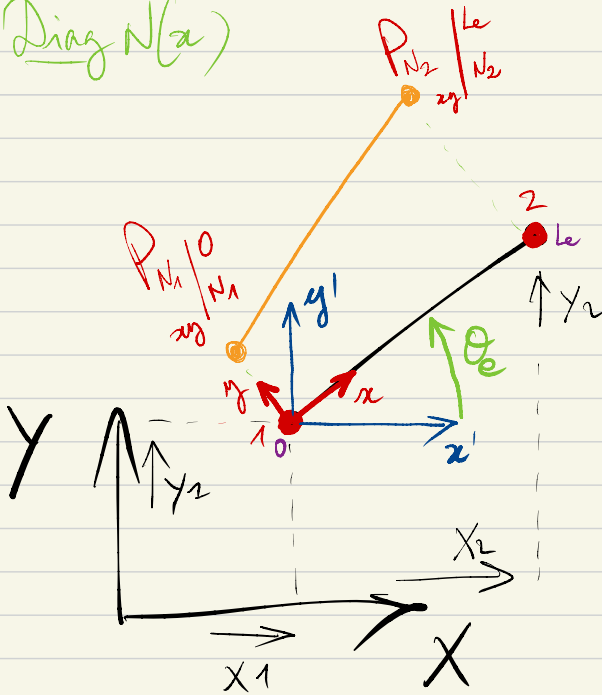
MS

Tracé des
efforts internes sur
système de poutres

20/12/2021

_____ /

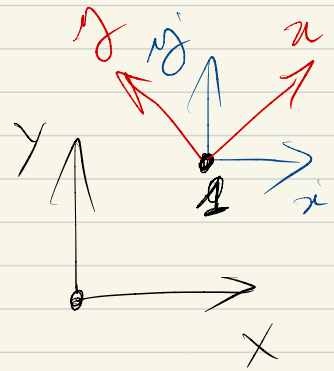
Diag N(a)



$$R \rightarrow G \rightarrow l$$

$$\begin{array}{c|c} \vec{v} & \vec{v} \\ \hline xy & xy \end{array}$$

$$\rightarrow \vec{v} = R \vec{v}$$

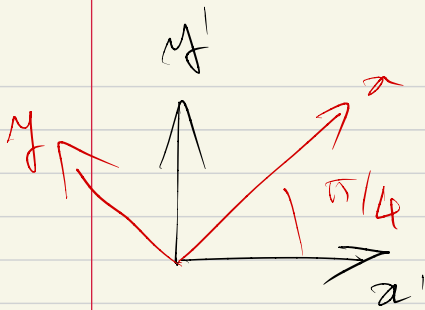


$$\underline{P_{xy}} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} + R^T P_{xy}$$

Coordonnées d'un
point dans repère
non

Coordonnées d'un pt
dans repère non ge

$$R^T(\theta_c) = \begin{bmatrix} \cos \theta_c & -\sin \theta_c \\ \sin \theta_c & \cos \theta_c \end{bmatrix}$$



$$R = \begin{bmatrix} \cos \frac{\pi}{4} & \sin \frac{\pi}{4} \\ -\sin \frac{\pi}{4} & \cos \frac{\pi}{4} \end{bmatrix}$$

$$\begin{cases} \vec{x} = \cos \theta \vec{x}' + \sin \theta \vec{y}' \\ \vec{y} = -\sin \theta \vec{x}' + \cos \theta \vec{y}' \end{cases}$$

$$\vec{v} = v_x \vec{x} + v_y \vec{y} = v_{x'} \vec{x}' + v_{y'} \vec{y}'$$

$$\begin{bmatrix} v_x \\ v_y \end{bmatrix}_{xy}$$

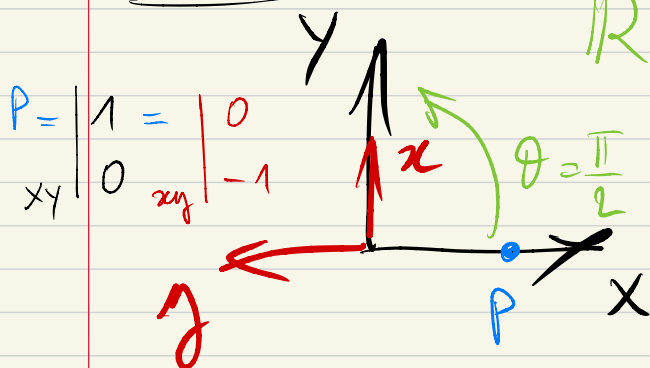
$$\begin{bmatrix} v_{x'} \\ v_{y'} \end{bmatrix}_{x'y'}$$

$$\begin{aligned} \vec{v} &= v_x (\cos \theta \vec{x}' + \sin \theta \vec{y}') + v_y (-\sin \theta \vec{x}' + \cos \theta \vec{y}') \\ &= (v_x \cos \theta - v_y \sin \theta) \vec{x}' + (v_x \sin \theta + v_y \cos \theta) \vec{y}' \end{aligned}$$

$$\begin{bmatrix} v_{x'} \\ v_{y'} \end{bmatrix}_{x'y'} = \underbrace{\begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}}_R \begin{bmatrix} v_x \\ v_y \end{bmatrix}$$

Example:

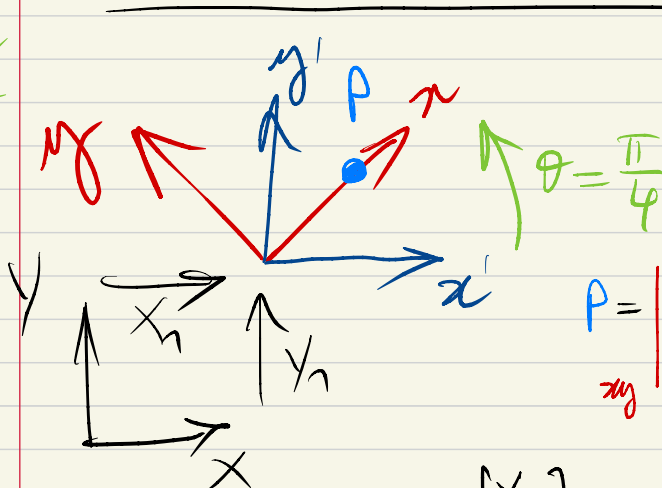
ROTATION



$$R(\theta) = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

$$P_{xy} = R P_{x'y'} \\ \begin{bmatrix} 0 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

ROTATION + TRANSLATION



$$R(\theta) = \frac{\sqrt{2}}{2} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$$

$$P = \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} \sqrt{2}/2 \\ \sqrt{2}/2 \end{bmatrix} = \begin{bmatrix} x_1 + \sqrt{2}/2 \\ y_1 + \sqrt{2}/2 \end{bmatrix}$$

$$P_{xy} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} + \underbrace{R^T \begin{bmatrix} 1 \\ 0 \end{bmatrix}}_{\text{translation vector}}$$

$$\frac{\sqrt{2}}{2} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \frac{\sqrt{2}}{2} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

g/a