

## Rappel Vecteurs

$$\vec{s} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} \quad \|\vec{s}\| = \sqrt{2^2 + 2^2} = \sqrt{8} = 2\sqrt{2}$$

$$\begin{aligned} \vec{s}_x = \|\vec{s}_x\| &= \|\vec{s}\| \cos \theta & \theta &= \cos^{-1} \left( \frac{\|\vec{s}\|}{\|\vec{s}_x\|} \right) \\ \vec{s}_y = \|\vec{s}_y\| &= \|\vec{s}\| \sin \theta & \Leftrightarrow \theta &= \sin^{-1} \left( \frac{\|\vec{s}\|}{\|\vec{s}_y\|} \right) \end{aligned}$$

$$\vec{u} \cdot \vec{v} = \|\vec{u}\| \cdot \|\vec{v}\| \cdot \cos \theta$$

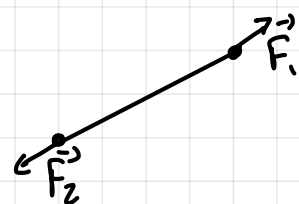
## II 2 La Force et la première loi de Newton

$$\vec{F}_{\text{res}} = \sum \vec{F} \text{ sur un objet}$$

1<sup>ère</sup> loi de Newton : Tout corps reste immobile ou conserve un MRU, i.e.  $\vec{F}_{\text{res}} = 0$

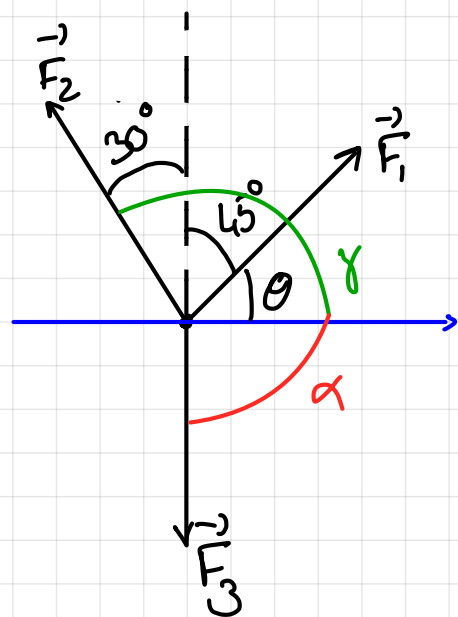
Exemple

1)



$$\vec{F}_{\text{res}} = \vec{0} \text{ soit } \vec{F}_1 \text{ donnée combien vaut } \vec{F}_2$$
$$\vec{F}_1 + \vec{F}_2 = \vec{0} \Leftrightarrow \vec{F}_1 = -\vec{F}_2$$

2)



$$\|\vec{F}_1\| = 500 \text{ N}$$

$$\|\vec{F}_2\| = 707 \text{ N}$$

$$\|\vec{F}_3\| = 966 \text{ N}$$

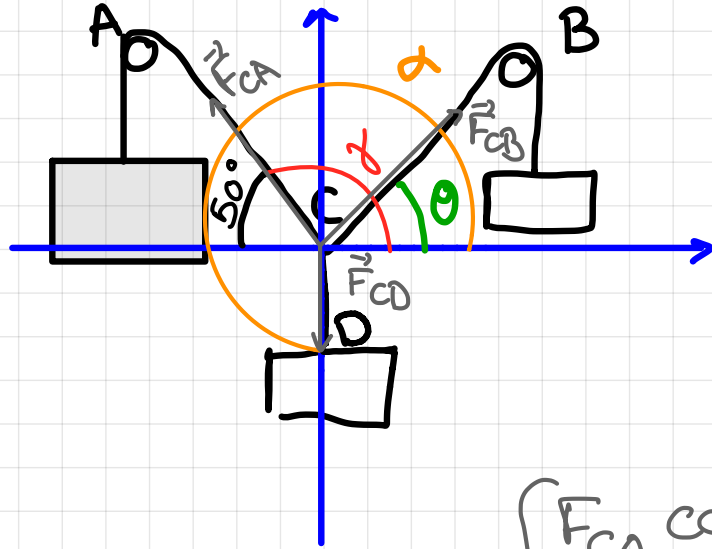
$$\theta = 90 - 45 = 45^\circ$$

$$\gamma = 90 + 30 = 120^\circ$$

$$\vec{F}_{\text{res}} = \|\vec{F}_1\| \begin{pmatrix} \cos(45) \\ \sin(45) \end{pmatrix} + \|\vec{F}_2\| \begin{pmatrix} \cos(120) \\ \sin(120) \end{pmatrix} + \|\vec{F}_3\| \begin{pmatrix} \cos(270) \\ \sin(270) \end{pmatrix}$$

$$= \|\vec{F}_1\| \begin{pmatrix} \cos(\pi/4) \\ \sin(\pi/4) \end{pmatrix} + \|\vec{F}_2\| \begin{pmatrix} \cos(2\pi/3) \\ \sin(2\pi/3) \end{pmatrix} + \|\vec{F}_3\| \begin{pmatrix} \cos(3\pi/2) \\ \sin(3\pi/2) \end{pmatrix}$$

$$= \begin{pmatrix} 354 \\ 354 \end{pmatrix} + \begin{pmatrix} -354 \\ 612 \end{pmatrix} + \begin{pmatrix} 0 \\ -966 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \text{ N} \Rightarrow \text{Le système est à l'équilibre}$$



$$F_{CD} = 800\text{N} \quad \alpha = 270^\circ \quad \theta = 30^\circ \quad \gamma = 180 - 50 = 130^\circ \quad \vec{F}_{CD} = \begin{pmatrix} 0 \\ -800 \end{pmatrix}$$

$$\vec{F}_{\text{res}} = \vec{0} \Leftrightarrow \|\vec{F}_{CA}\| \begin{pmatrix} \cos(130^\circ) \\ \sin(130^\circ) \end{pmatrix} + \|\vec{F}_{CB}\| \begin{pmatrix} \cos(30^\circ) \\ \sin(30^\circ) \end{pmatrix} + \begin{pmatrix} 0 \\ -800 \end{pmatrix}$$

$$\begin{cases} F_{CA} \cos(130) + F_{CB} \cos(30) = 0 \\ F_{CA} \sin(130) + F_{CB} \sin(30) - 800 = 0 \end{cases} \Leftrightarrow \begin{cases} F_{CA} = \frac{-F_{CB} \cos(30)}{\cos(130)} \\ -\frac{F_{CB} \cos(30)}{\cos(130)} \sin(130) + F_{CB} \sin(30) - 800 = 0 \end{cases}$$

$$-F_{CB} \cos(30) \tan(130) + F_{CB} \sin(30) - 800$$