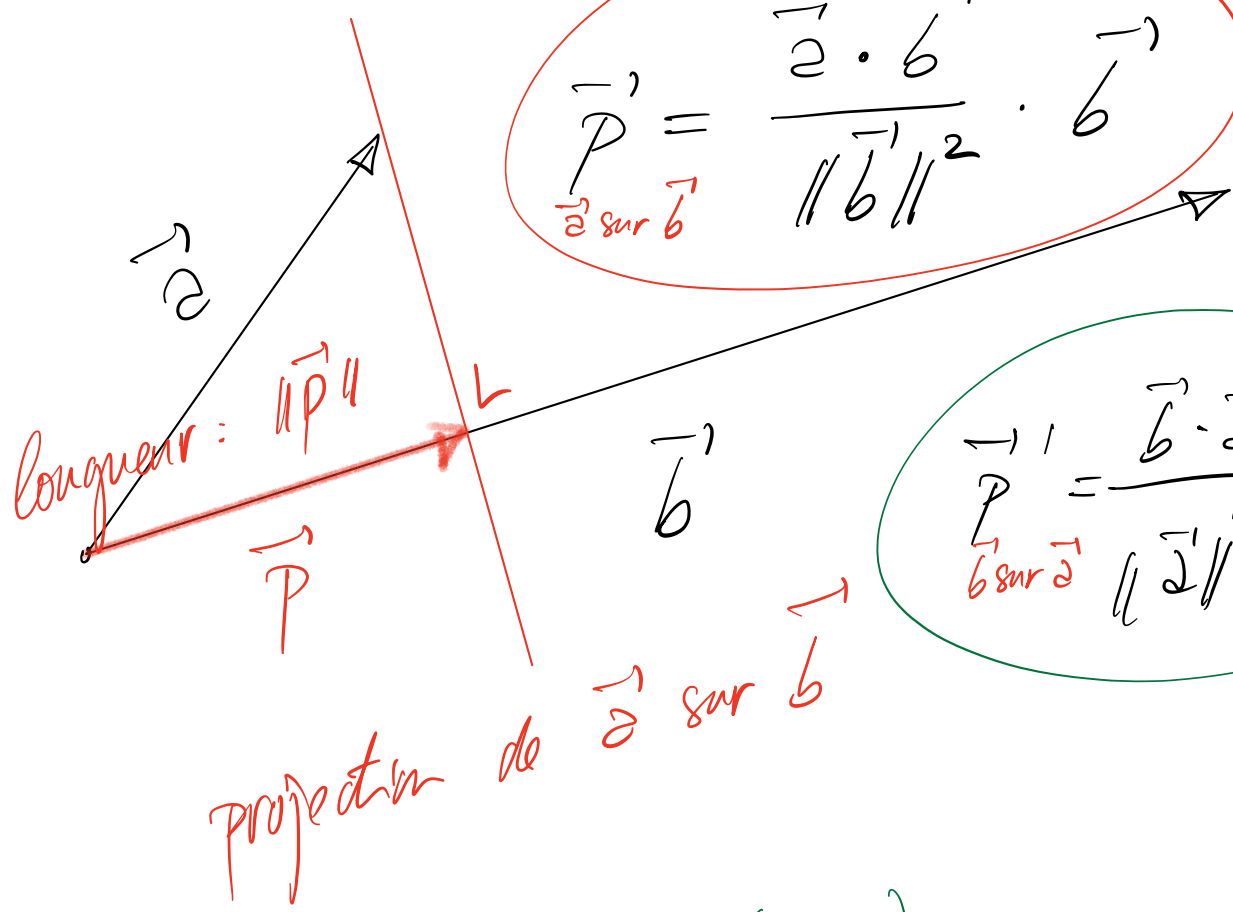


Projection orthogonale



$$\vec{p}_{\vec{a} \text{ sur } \vec{b}} = \frac{\vec{a} \cdot \vec{b}}{\|\vec{b}\|^2} \cdot \vec{b}$$

$$\vec{p}_{\vec{b} \text{ sur } \vec{a}} = \frac{\vec{b} \cdot \vec{a}}{\|\vec{a}\|^2} \cdot \vec{a}$$

Exemple:

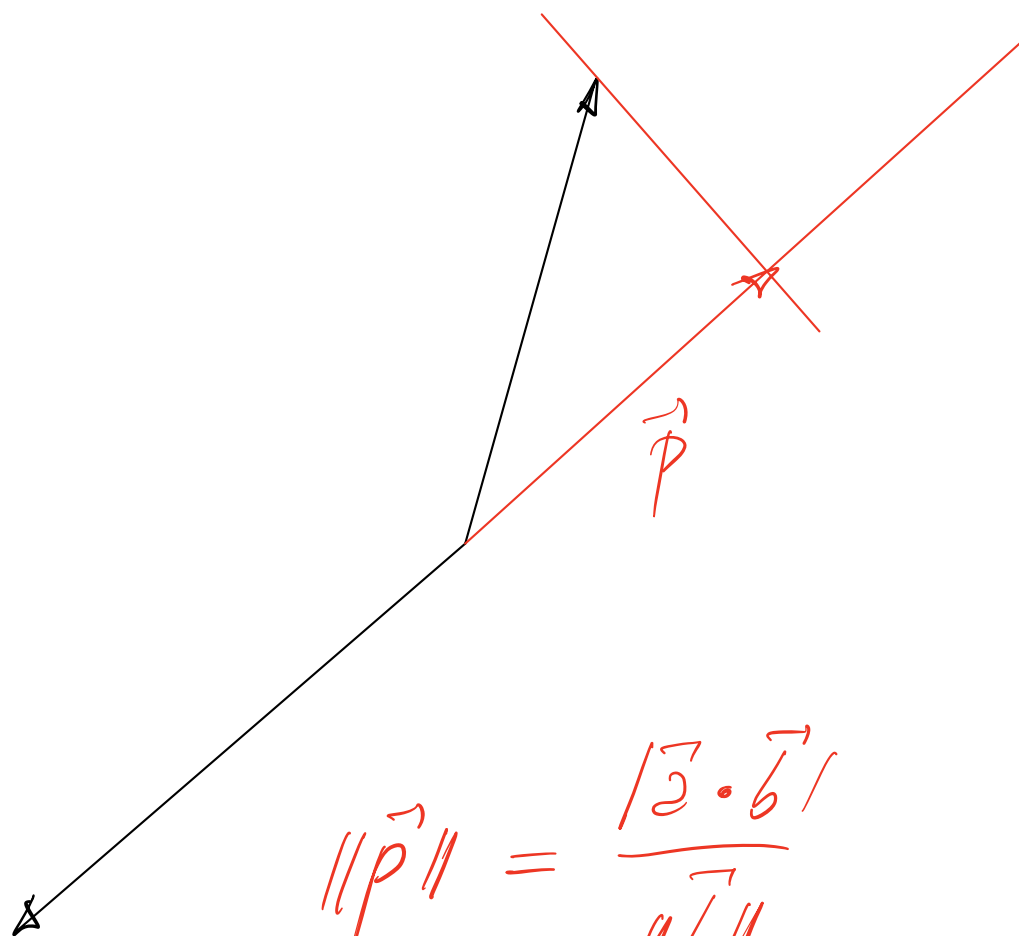
$$\vec{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$$\vec{b} = \begin{pmatrix} 6 \\ -1 \end{pmatrix}$$

$\vec{a}$ sur $\vec{b}$

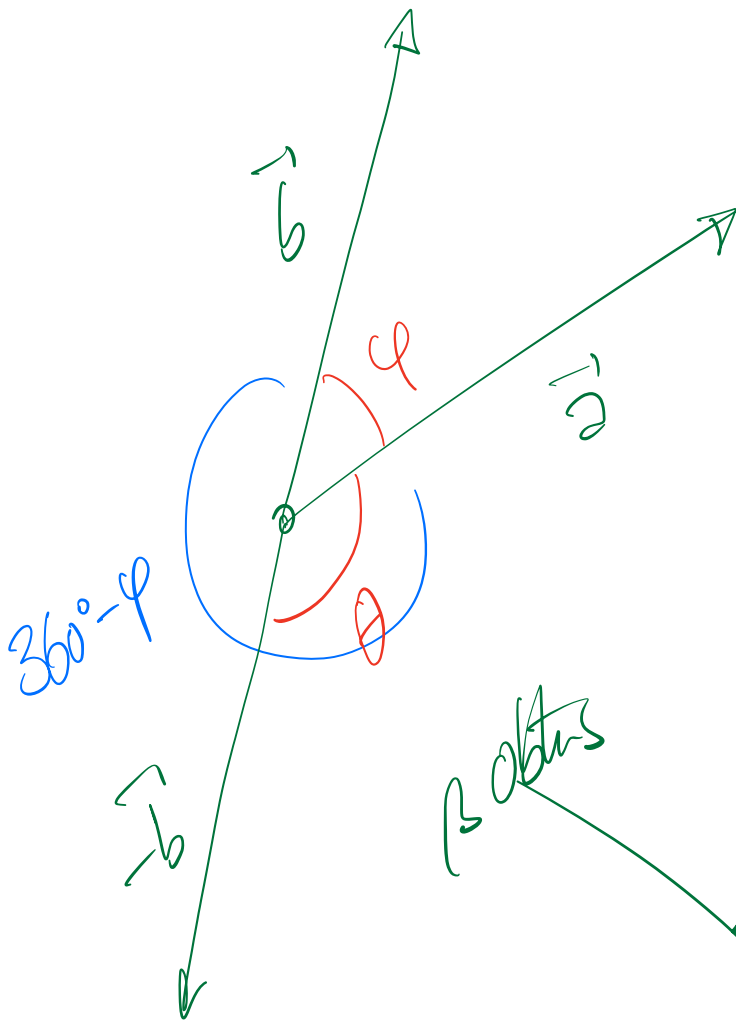
$$\vec{p} = \frac{12 - 3}{(\sqrt{36 + 1})^2} \cdot \begin{pmatrix} 6 \\ -1 \end{pmatrix}$$

$$\vec{p} = \frac{9}{37} \cdot \begin{pmatrix} 6 \\ -1 \end{pmatrix} = \begin{pmatrix} 54/37 \\ -9/37 \end{pmatrix}$$



$$\|\vec{p}\| = \frac{|\vec{v} \cdot \vec{u}|}{\|\vec{u}\|}$$

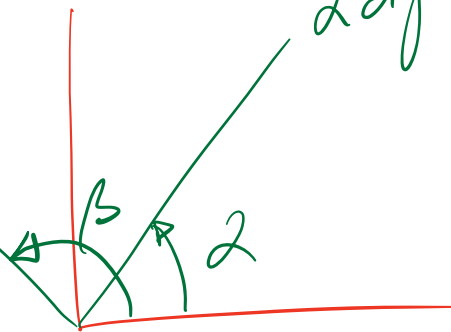
$$\cos \varphi = \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \cdot \|\vec{b}\|}$$

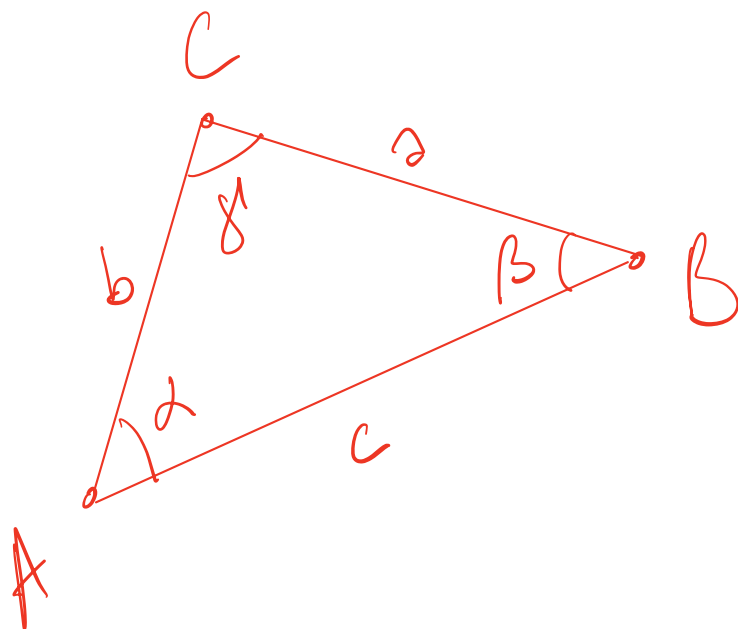


$$\cos^{-1}$$

entre 0 et 180°

β obtus

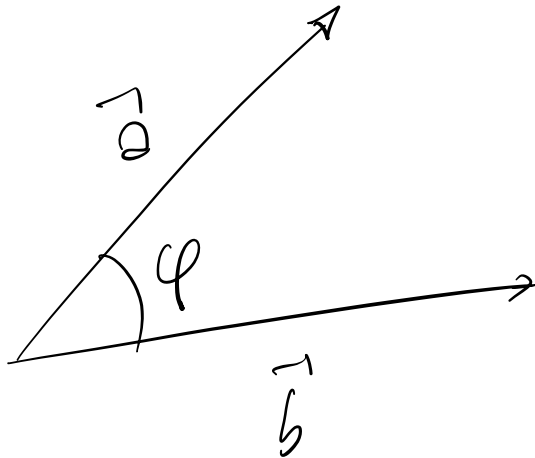




EX01 pairs EX03

EX02 pairs EX04

$$\vec{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad \vec{b} = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$$



$$\cos \varphi = \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \cdot \|\vec{b}\|}$$

$$= \frac{3 \cdot 5 + 4 \cdot 6}{\sqrt{9+16} \sqrt{25+36}}$$

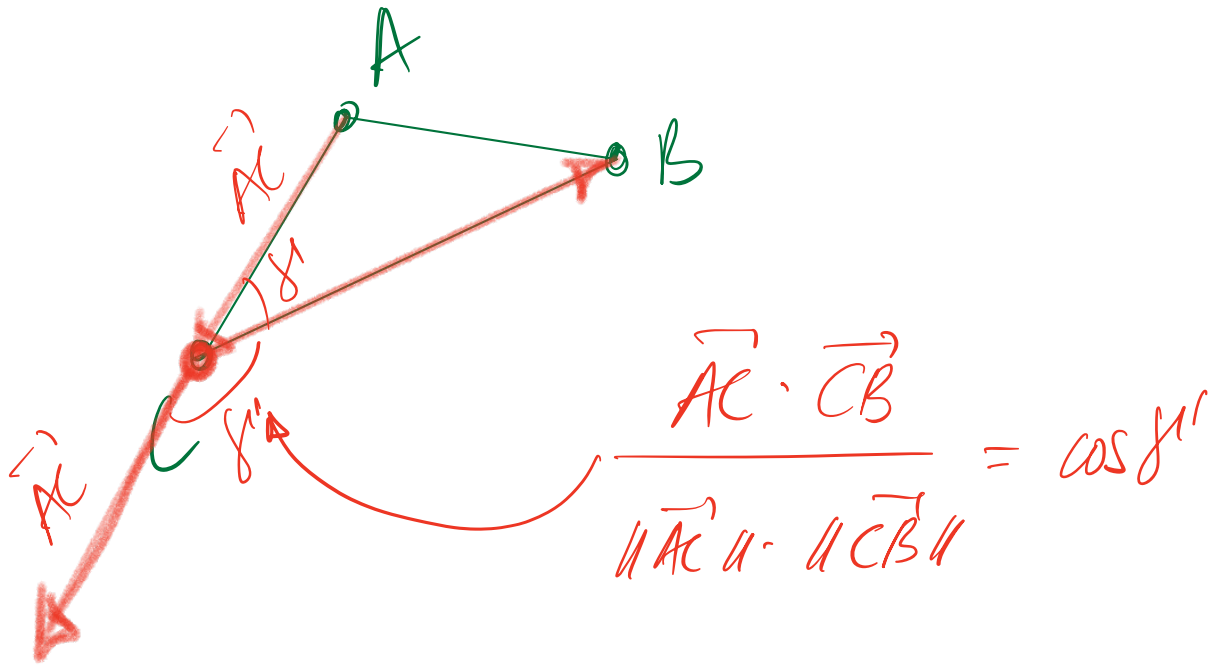
$$= \frac{39}{\sqrt{25} \sqrt{61}} = \frac{39}{5 \sqrt{61}}$$

$$\cos \varphi \simeq 0,99868766$$

$$\varphi \simeq \cos^{-1}(0,99868766)$$

sans dim.

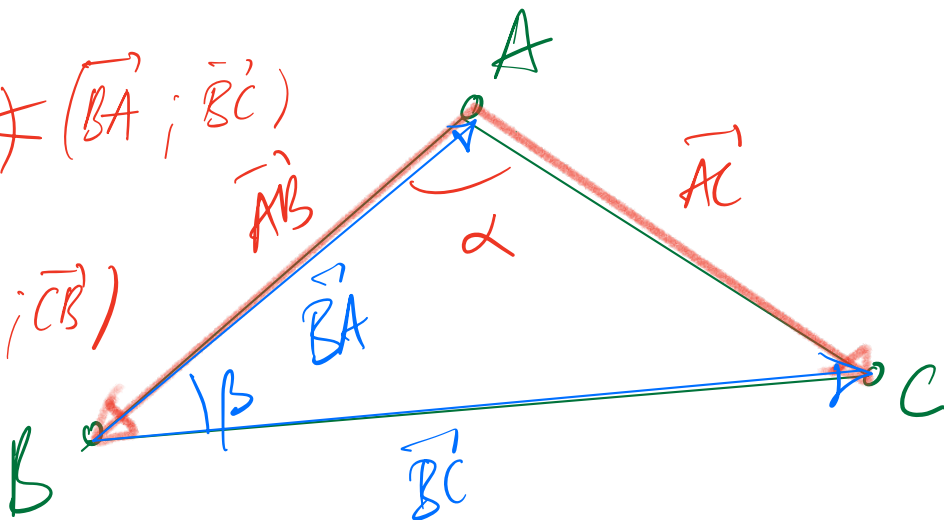
$$\varphi \simeq 2,936 \simeq 2,9^\circ$$



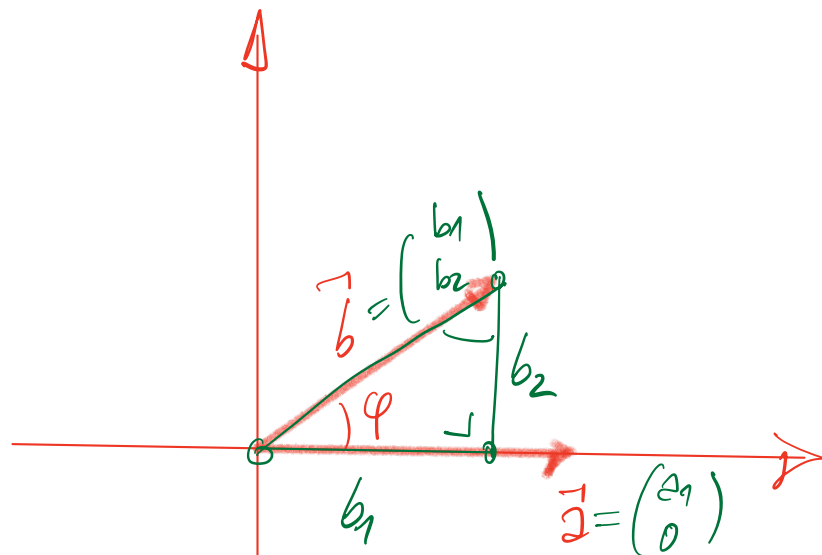
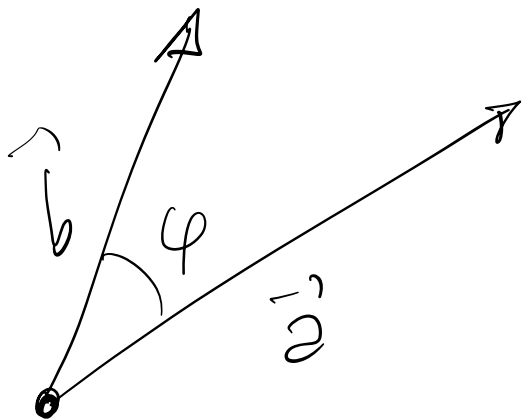
$$\alpha \neq (\vec{AB}; \vec{AC})$$

$$\beta \neq (\vec{BA}; \vec{BC})$$

$$\gamma \neq (\vec{CA}; \vec{CB})$$



$$\cos \varphi = \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \cdot \|\vec{b}\|}$$



$$\vec{a} \cdot \vec{b} = \boxed{a_1 b_1 + 0 \cdot b_2}$$

$$\|\vec{a}\| = \sqrt{0^2 + a_1^2} = \sqrt{a_1^2} = a_1$$

$$\cos \varphi = \frac{b_1}{\sqrt{b_1^2 + b_2^2}}$$

$$= \frac{b_1}{\|\vec{b}\|}$$

$$\cos \varphi = \frac{a_1 \cdot b_1}{a_1 \cdot \|\vec{b}\|}$$

$$= \frac{a_1 \cdot b_1 + 0 \cdot b_2}{\|\vec{a}\| \|\vec{b}\|}$$

$$= \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \cdot \|\vec{b}\|}$$