

Ex 1.4.1 (dans le plan)

a) $\| \begin{pmatrix} 0 \\ -5 \end{pmatrix} \| = \sqrt{0^2 + (-5)^2} = \sqrt{0+25} = \underline{5}$

$\| \begin{pmatrix} 3 \\ 8 \end{pmatrix} \| = \sqrt{3^2 + 8^2} = \sqrt{9+64} = \underline{\sqrt{73}}$

$\| \begin{pmatrix} 1/2 \\ 5/2 \end{pmatrix} \| = \sqrt{\frac{1}{4} + \frac{25}{4}} = \sqrt{\frac{26}{4}} = \frac{\sqrt{26}}{\sqrt{4}} = \underline{\frac{\sqrt{26}}{2}}$ ou $\sqrt{\frac{26}{4}} = \underline{\sqrt{\frac{13}{2}}}$

$\| \begin{pmatrix} 6/10 \\ -4/5 \end{pmatrix} \| = \| \begin{pmatrix} 3/5 \\ -4/5 \end{pmatrix} \| = \sqrt{\frac{9}{25} + \frac{16}{25}} = \sqrt{\frac{25}{25}} = \sqrt{1} = \underline{1}$
 ou $\sqrt{\frac{36}{100} + \frac{16}{25}} = \sqrt{\frac{9}{25} + \frac{16}{25}} = \dots$

b) $\begin{pmatrix} -1/\sqrt{5} \\ 6/\sqrt{45} \end{pmatrix}$ est unitaire car $\sqrt{\frac{1}{5} + \frac{36}{45}} = \sqrt{\frac{1}{5} + \frac{4}{5}} = \sqrt{\frac{5}{5}} = \sqrt{1} = 1$ #

c) modifié : Donner un vecteur colinéaire et unitaire :

$\vec{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $\| \vec{a} \| = \sqrt{9+16} = 5 \Rightarrow \vec{u}_a = \frac{1}{5} \begin{pmatrix} 3 \\ 4 \end{pmatrix} = \underline{\begin{pmatrix} 3/5 \\ 4/5 \end{pmatrix}}$ ou $\begin{pmatrix} -3/5 \\ -4/5 \end{pmatrix}$

$\vec{b} = \begin{pmatrix} 12 \\ -5 \end{pmatrix}$ $\| \vec{b} \| = \sqrt{144+25} = 13 \Rightarrow \vec{u}_b = \frac{1}{13} \begin{pmatrix} 12 \\ -5 \end{pmatrix} = \underline{\begin{pmatrix} 12/13 \\ -5/13 \end{pmatrix}}$ ou $\begin{pmatrix} -12/13 \\ 5/13 \end{pmatrix}$

$\vec{c} = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$ $\| \vec{c} \| = \sqrt{36+0} = 6 \Rightarrow \vec{u}_c = \frac{1}{6} \begin{pmatrix} -6 \\ 0 \end{pmatrix} = \underline{\begin{pmatrix} -1 \\ 0 \end{pmatrix}}$ ou $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

d) $\| \vec{a} \| = 10 \Leftrightarrow \| \begin{pmatrix} 8 \\ k-1 \end{pmatrix} \| = 10$

$\Leftrightarrow \sqrt{8^2 + (k-1)^2} = 10 \quad | \quad ()^2 \text{ et } \wedge$

$\Leftrightarrow 64 + k^2 - 2k + 1 = 100$

$\Leftrightarrow k^2 - 2k - 35 = 0$

$\Leftrightarrow (k+5)(k-7) = 0 \quad \text{ou avec } \Delta = \dots$

$\Rightarrow k = \begin{cases} \underline{-5} & : \text{ vérif. : } \sqrt{8^2 + (-6)^2} = \sqrt{64+36} = 10 \\ \underline{7} & : \quad \quad \quad \sqrt{8^2 + 6^2} = 10 \end{cases}$

$$e) \quad \|\vec{u} + m\vec{v}\| = \sqrt{82} \Leftrightarrow \left\| \begin{pmatrix} 2 \\ 3 \end{pmatrix} + m \begin{pmatrix} -2 \\ 4 \end{pmatrix} \right\| = \sqrt{82}$$

$$\Leftrightarrow \left\| \begin{pmatrix} 2-2m \\ 3+4m \end{pmatrix} \right\| = \sqrt{82}$$

$$\Leftrightarrow \sqrt{(2-2m)^2 + (3+4m)^2} = \sqrt{82} \quad | \quad ()^2 + c.c.$$

$$\Leftrightarrow 4 - 8m + 4m^2 + 9 + 24m + 16m^2 = 82$$

$$\Leftrightarrow 20m^2 + 16m - 69 = 0 \quad \Delta = 5776 = 76^2$$

$$\Rightarrow m = \frac{-16 \pm 76}{40} = \begin{cases} \underline{\underline{-\frac{23}{10}}} \\ \underline{\underline{\frac{3}{2}}} \end{cases}$$

Ex 1.4.2 modifié

A(2;1)

B(4;3)

C(2;6)

$$\vec{AB} = \vec{OB} - \vec{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} \Rightarrow \|\vec{AB}\| = \sqrt{4+4} = \sqrt{8}$$

$$\vec{AC} = \begin{pmatrix} 0 \\ 5 \end{pmatrix} \Rightarrow \|\vec{AC}\| = \sqrt{0+25} = 5$$

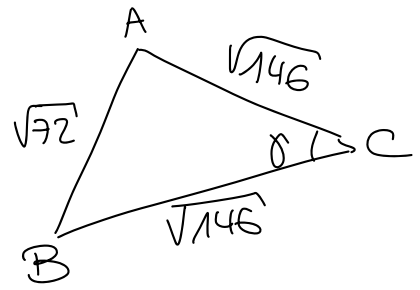
$$\vec{BC} = \begin{pmatrix} -2 \\ 3 \end{pmatrix} \Rightarrow \|\vec{BC}\| = \sqrt{4+9} = \sqrt{13}$$

$$\Rightarrow \text{périmètre} = \underline{\underline{\sqrt{8} + 5 + \sqrt{13}}} \text{ u} \cong 11,43 \text{ u}$$

Ex 1.4.3

$$A(6;4) \quad B(12;-2) \quad C(17;9)$$

$$\vec{AB} = \begin{pmatrix} 6 \\ -6 \end{pmatrix} \quad \vec{AC} = \begin{pmatrix} 11 \\ 5 \end{pmatrix} \quad \vec{BC} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$$



• $\|\vec{AC}\| = \|\vec{BC}\| = \sqrt{121+25} = \sqrt{146} \Rightarrow$ le triangle est isocèle en C #

• $\mathcal{A} = \frac{1}{2} \left| \det(\vec{AB}, \vec{AC}) \right| = \frac{1}{2} \left| \begin{vmatrix} 6 & 11 \\ -6 & 5 \end{vmatrix} \right| = \frac{1}{2} \cdot |6 \cdot 5 - (-6) \cdot 11| = \frac{1}{2} \cdot 96 = \underline{48 u^2}$

Variante :

$$\|\vec{AB}\| = \sqrt{36+36} = \sqrt{36 \cdot 2} = 6\sqrt{2} \Rightarrow \frac{1}{2} \|\vec{AB}\| = \sqrt{18} = 3\sqrt{2}$$

$$\text{hauteur du } \Delta \text{ issue de C : } h = \sqrt{146 - 18} = \sqrt{128} = 8\sqrt{2}$$

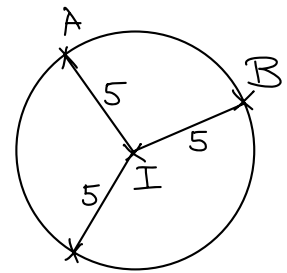
$$\Rightarrow \mathcal{A}_{\Delta} = \frac{1}{2} \cdot 6\sqrt{2} \cdot 8\sqrt{2} = 24 \cdot 2 = \underline{48 u^2} \quad (\text{car } \Delta \text{ isocèle})$$

Ex 1.4.4

$$A(7;1) \quad B(5;5) \quad C(5;-3) \quad I(2;1)$$

$$\vec{AI} = \begin{pmatrix} -5 \\ 0 \end{pmatrix} \quad \vec{BI} = \begin{pmatrix} -3 \\ -4 \end{pmatrix} \quad \vec{CI} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$$

$$\|\vec{AI}\| = \|\vec{BI}\| = \|\vec{CI}\| = 5$$

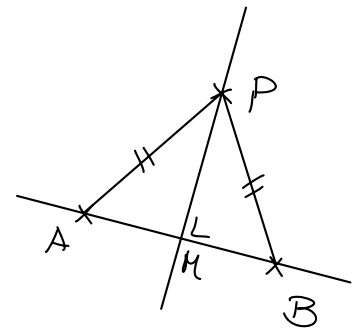


\Rightarrow A, B, C sont sur le cercle de centre I et de rayon 5 u #

Ex 1.4.5

P(2; -1) A(5; 3) B(-2; k)

$$\vec{PA} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad \vec{PB} = \begin{pmatrix} -4 \\ k+1 \end{pmatrix}$$



$$\text{P sur la médiatrice} \Leftrightarrow \|\vec{PA}\| = \|\vec{PB}\|$$

$$\Leftrightarrow 5 = \sqrt{16 + (k+1)^2} \quad | \quad ()^2$$

$$\Leftrightarrow 25 = 16 + k^2 + 2k + 1$$

$$\Leftrightarrow k^2 + 2k - 8 = 0$$

$$\Leftrightarrow (k+4)(k-2) = 0$$

$$\Rightarrow \underline{k} = \begin{cases} \underline{-4} \\ \underline{2} \end{cases} \quad \text{vérif: } 5 = \sqrt{16 + (-3)^2} \quad \checkmark$$
$$5 = \sqrt{16 + 3^2} \quad \checkmark$$

Ex 1.4.6 modifié

A(1; 2) B(3; 8) P(2; y)

$$\vec{PA} = \begin{pmatrix} 1-2 \\ 2-y \end{pmatrix} = \begin{pmatrix} -1 \\ 2-y \end{pmatrix} \quad \vec{PB} = \begin{pmatrix} 3-2 \\ 8-y \end{pmatrix} = \begin{pmatrix} 1 \\ 8-y \end{pmatrix}$$

$$\text{P sur la médiatrice} \Leftrightarrow \|\vec{PA}\| = \|\vec{PB}\|$$

$$\Leftrightarrow \sqrt{(-1)^2 + (2-y)^2} = \sqrt{1^2 + (8-y)^2} \quad | \quad ()^2$$

$$\Leftrightarrow 1 + 4 - 4y + y^2 = 1 + 64 - 16y + y^2$$

$$\Leftrightarrow 12y = 60$$

$$\Leftrightarrow y = 5$$

$$\text{vérif: } \sqrt{(-1)^2 + (-3)^2} = \sqrt{1^2 + 3^2} \quad \checkmark$$

Ex 1.4.9

$$a) \vec{a} \cdot \vec{b} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \cdot \begin{pmatrix} 7 \\ 3 \end{pmatrix} = 2 \cdot 7 + (-5) \cdot 3 = 14 - 15 = -1 \neq 0 \Leftrightarrow \underline{\vec{a} \not\perp \vec{b}}$$

$$b) \begin{pmatrix} 53 \\ -41 \end{pmatrix} \cdot \begin{pmatrix} 41 \\ 53 \end{pmatrix} = 53 \cdot 41 + (-41) \cdot 53 = 0 \Leftrightarrow \underline{\vec{a} \perp \vec{b}}$$

$$c) \begin{pmatrix} -8 \\ 3 \end{pmatrix} \cdot \begin{pmatrix} 6 \\ 16 \end{pmatrix} = -8 \cdot 6 + 3 \cdot 16 = -48 + 48 = 0 \Leftrightarrow \underline{\vec{a} \perp \vec{b}}$$

$$d) \begin{pmatrix} 1/2 \\ -1/3 \end{pmatrix} \cdot \begin{pmatrix} 5 \\ 3/4 \end{pmatrix} = \frac{1}{2} \cdot 5 + \left(-\frac{1}{3}\right) \cdot \frac{3}{4} = \frac{5}{2} - \frac{1}{4} = \frac{10-1}{4} = \frac{9}{4} \neq 0 \Leftrightarrow \underline{\vec{a} \not\perp \vec{b}}$$

Ex 1.4.11

$$a) \begin{pmatrix} m \\ -2 \end{pmatrix} \perp \begin{pmatrix} 3 \\ 5 \end{pmatrix} \Leftrightarrow \begin{pmatrix} m \\ -2 \end{pmatrix} \cdot \begin{pmatrix} 3 \\ 5 \end{pmatrix} = 0 \Leftrightarrow 3m - 10 = 0 \Leftrightarrow m = \underline{\frac{10}{3}}$$

$$c) \vec{v} = k\vec{u} + \vec{w} \Leftrightarrow \underline{\vec{w}} = \vec{v} - k\vec{u} = \begin{pmatrix} -3 \\ m \end{pmatrix} - k \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \underline{\begin{pmatrix} -3-k \\ m-3k \end{pmatrix}}$$

$$\vec{u} \perp \vec{w} \Leftrightarrow \vec{u} \cdot \vec{w} = 0$$

$$\Leftrightarrow \begin{pmatrix} 1 \\ 3 \end{pmatrix} \cdot \begin{pmatrix} -3-k \\ m-3k \end{pmatrix} = 0$$

$$\Leftrightarrow 1 \cdot (-3-k) + 3(m-3k) = 0$$

$$\Leftrightarrow -3-k+3m-9k = 0$$

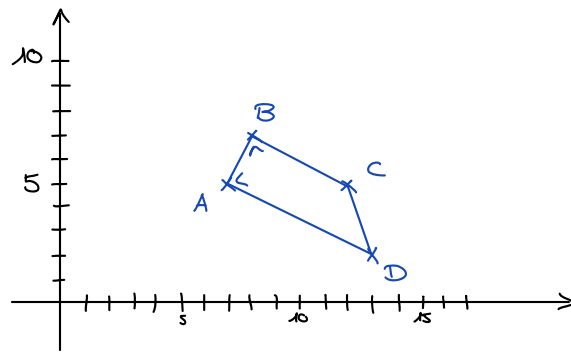
$$\Leftrightarrow -10k+3m = 0 \Leftrightarrow \underline{k=3}$$

$$\Rightarrow \underline{\vec{w}} = \begin{pmatrix} -3-3 \\ m-3 \cdot 3 \end{pmatrix} = \underline{\begin{pmatrix} -6 \\ 2 \end{pmatrix}}$$

Ex 1.4.12

$$A(7;5) \quad B(8;7) \quad C(12;5) \quad D(13;2)$$

- Pour prouver que ABCD est un trapèze rectangle rectangle en A et B (cf représentation)



il suffit de prouver que les angles en A et en B sont droits.

$$\vec{AB} = \begin{pmatrix} 8 \\ 7 \end{pmatrix} - \begin{pmatrix} 7 \\ 5 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad \vec{AD} = \begin{pmatrix} 13 \\ 2 \end{pmatrix} - \begin{pmatrix} 7 \\ 5 \end{pmatrix} = \begin{pmatrix} 6 \\ -3 \end{pmatrix} \quad \vec{BC} = \begin{pmatrix} 12 \\ 5 \end{pmatrix} - \begin{pmatrix} 8 \\ 7 \end{pmatrix} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$$

$$\vec{AB} \cdot \vec{AD} = 6 - 6 = 0 \Leftrightarrow \vec{AB} \perp \vec{AD}$$

$$\vec{AB} \cdot \vec{BC} = 4 - 4 = 0 \Leftrightarrow \vec{AB} \perp \vec{BC}$$

} \Rightarrow ABCD est un trap. rectangle en A et B #

- $\|\vec{AB}\| = \sqrt{1+4} = \sqrt{5}$

$$\|\vec{AD}\| = \sqrt{36+9} = \sqrt{45} = \sqrt{9 \cdot 5} = 3\sqrt{5}$$

$$\|\vec{BC}\| = \sqrt{16+4} = \sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5}$$

$$\Rightarrow \mathcal{A} = \frac{3\sqrt{5} + 2\sqrt{5}}{2} \cdot \sqrt{5} = \frac{5\sqrt{5}}{2} \cdot \sqrt{5} = \frac{5 \cdot 5}{2} = \underline{\underline{\frac{25}{2} \text{ u}^2}}$$

Ex 1.4.14

$$a) \underbrace{\vec{a}}_{\text{vecteur}} \cdot \underbrace{(7\vec{b} + \vec{c})}_{\text{vecteur}} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} 35+7 \\ -7+1 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} 42 \\ -6 \end{pmatrix} = 3 \cdot 42 + 4 \cdot (-6) = 126 - 24 = \underline{102}$$

$$b) \underbrace{(\vec{a} \cdot \vec{b})}_{\text{nbre}} \underbrace{\vec{b}}_{\text{vecteur}} = (3 \cdot 5 + 4 \cdot (-1)) \begin{pmatrix} 5 \\ -1 \end{pmatrix} = 11 \begin{pmatrix} 5 \\ -1 \end{pmatrix} = \underline{\begin{pmatrix} 55 \\ -11 \end{pmatrix}}$$

$$c) \underbrace{(\vec{a} \cdot \vec{b})}_{\text{nbre}} + \underbrace{(\vec{c} \cdot \vec{d})}_{\text{nbre}} = 11 + (7 \cdot 0 + 1 \cdot 3) = 11 + 3 = \underline{14}$$

$$d) \underbrace{(\vec{a} + \vec{b})}_{\text{vect.}} \cdot \underbrace{(\vec{c} - \vec{d})}_{\text{vect.}} = \begin{pmatrix} 8 \\ 3 \end{pmatrix} \cdot \begin{pmatrix} 7 \\ -2 \end{pmatrix} = 8 \cdot 7 + 3 \cdot (-2) = 56 - 6 = \underline{50}$$

$$e) \underbrace{\|\vec{d}\|}_{\text{nbre}} \underbrace{(\vec{a} \cdot \vec{d})}_{\text{nbre}} = \sqrt{0+9} (3 \cdot 0 + 4 \cdot 3) = 3 \cdot 12 = \underline{36}$$

$$f) \underbrace{\vec{a}}_{\text{vect.}} + \underbrace{(\vec{b} \cdot \vec{c})}_{\text{nbre}}$$

pas défini on ne peut pas additionner un vecteur et un nombre !

Ex 1.4.16

A(-2;4) B(1;-2) et C(λ;λ)

a) ΔABC rectangle en A

$$\vec{AB} = \begin{pmatrix} 1+2 \\ -2-4 \end{pmatrix} = \begin{pmatrix} 3 \\ -6 \end{pmatrix}$$

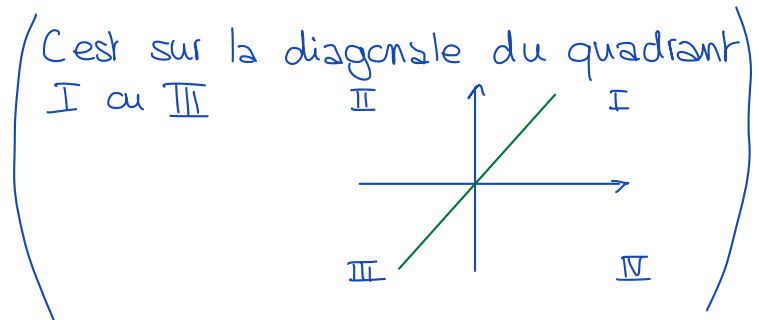
$$\vec{AC} = \begin{pmatrix} \lambda+2 \\ \lambda-4 \end{pmatrix}$$

$$\vec{AB} \perp \vec{AC} \Leftrightarrow \vec{AB} \cdot \vec{AC} = 0 \Leftrightarrow 3(\lambda+2) + (-6)(\lambda-4) = 0$$

$$\Leftrightarrow 3\lambda + 6 - 6\lambda + 24 = 0$$

$$\Leftrightarrow -3\lambda + 30 = 0$$

$$\Leftrightarrow \lambda = 10 \Rightarrow \underline{C(10;10)}$$



b) ΔABC rectangle en B

$$\vec{AB} = \begin{pmatrix} 1+2 \\ -2-4 \end{pmatrix} = \begin{pmatrix} 3 \\ -6 \end{pmatrix}$$

$$\vec{BC} = \begin{pmatrix} \lambda-1 \\ \lambda+2 \end{pmatrix}$$

$$\vec{AB} \perp \vec{BC} \Leftrightarrow \vec{AB} \cdot \vec{BC} = 0 \Leftrightarrow 3(\lambda-1) + (-6)(\lambda+2) = 0$$

$$\Leftrightarrow 3\lambda - 3 - 6\lambda - 12 = 0$$

$$\Leftrightarrow -3\lambda - 15 = 0$$

$$\Leftrightarrow \lambda = -5 \Rightarrow \underline{C_2(-5; -5)}$$

c) ΔABC rectangle en C

$$\vec{AC} = \begin{pmatrix} \lambda+2 \\ \lambda-4 \end{pmatrix}$$

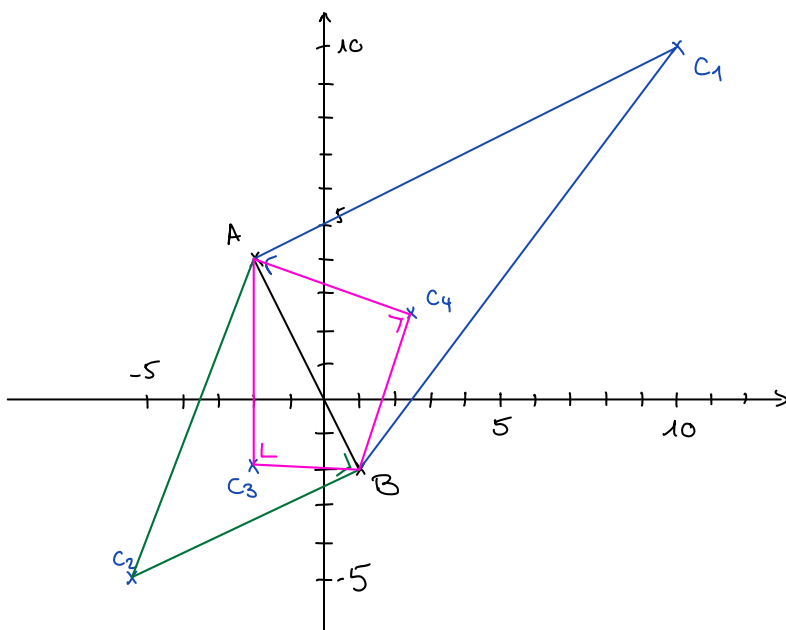
$$\vec{BC} = \begin{pmatrix} \lambda-1 \\ \lambda+2 \end{pmatrix}$$

$$\vec{AC} \perp \vec{BC} \Leftrightarrow \vec{AC} \cdot \vec{BC} = 0 \Leftrightarrow (\lambda+2)(\lambda-1) + (\lambda-4)(\lambda+2) = 0$$

$$\Leftrightarrow \lambda^2 + 2\lambda - \lambda - 2 + \lambda^2 - 4\lambda + 2\lambda - 8 = 0$$

$$\Leftrightarrow 2\lambda^2 - \lambda - 10 = 0 \quad \Delta = 81$$

$$\Rightarrow \lambda_{1,2} = \frac{1 \pm 9}{4} = \begin{cases} -2 & \Rightarrow \underline{C_3(-2; -2)} \\ \frac{5}{2} & \Rightarrow \underline{C_4\left(\frac{5}{2}; \frac{5}{2}\right)} \end{cases}$$



C_3 et C_4 sont sur le cercle de Thalès de AB.

1.4.17

rectangle en A : $4(k-1)-2=0 \Leftrightarrow 4k-6=0 \Leftrightarrow k=3/2 \Rightarrow C(3/2; 5)$
rectangle en B : $4(k-5)-6=0 \Leftrightarrow 4k-26=0 \Leftrightarrow k=13/2 \Rightarrow C'(13/2; 5)$

rectangle en C : $\vec{CB} = \begin{pmatrix} 5-k \\ -3 \end{pmatrix}$ $\vec{CA} = \begin{pmatrix} 1-k \\ -1 \end{pmatrix}$

$$\vec{CB} \perp \vec{CA} \Leftrightarrow \vec{CB} \cdot \vec{CA} = 0$$

$$\Leftrightarrow \begin{pmatrix} 5-k \\ -3 \end{pmatrix} \cdot \begin{pmatrix} 1-k \\ -1 \end{pmatrix} = 0$$

$$= (5-k)(1-k) + 3 = 0$$

$$\Leftrightarrow 5 - 5k - k + k^2 + 3 = 0$$

$$\Leftrightarrow k^2 - 6k + 8 = 0$$

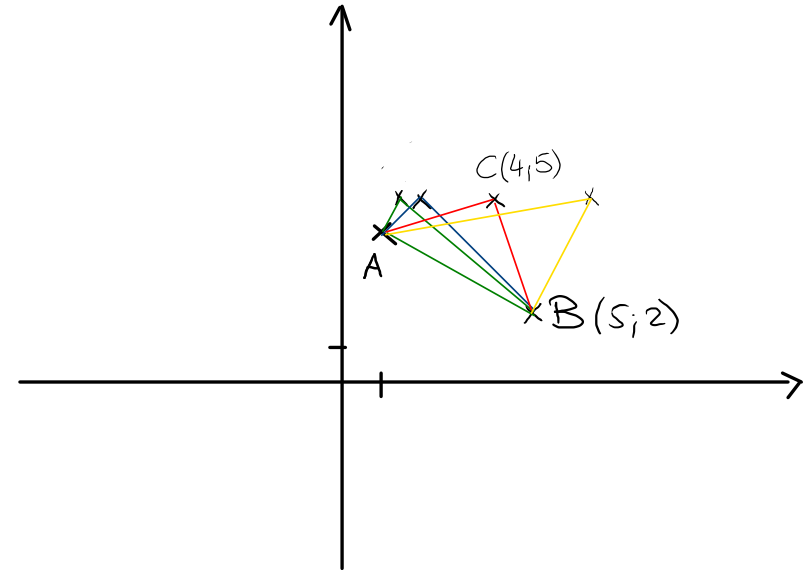
$$\Leftrightarrow \begin{matrix} (k-4)(k-2) = 0 \\ \downarrow \qquad \downarrow \\ k=4 \quad k=2 \end{matrix}$$

$$\Rightarrow C_1(2; 5) \quad \text{ou} \quad C_2(4; 5)$$

$$\|\vec{AC}_2\| = \left\| \begin{pmatrix} 4-1 \\ 5-4 \end{pmatrix} \right\| = \left\| \begin{pmatrix} 3 \\ 1 \end{pmatrix} \right\| = \sqrt{9+1} = \sqrt{10}$$

$$\|\vec{BC}_2\| = \left\| \begin{pmatrix} 4-5 \\ 5-2 \end{pmatrix} \right\| = \left\| \begin{pmatrix} -1 \\ 3 \end{pmatrix} \right\| = \sqrt{1+9} = \sqrt{10}$$

$\geq = \checkmark$



Ex 1.4.28

$$\vec{AB} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$$

$$\vec{CD} = \begin{pmatrix} -5 \\ 0 \end{pmatrix}$$

$$\Rightarrow \begin{cases} \vec{AB} \cdot \vec{CD} = -30 + 0 = -30 \\ \|\vec{AB}\| = \sqrt{36+4} = \sqrt{40} = 2\sqrt{10} \\ \|\vec{CD}\| = 5 \end{cases}$$

$$\cos(\alpha) = \frac{-30}{2\sqrt{10} \cdot 5} = \frac{-3}{\sqrt{10}} \quad \Leftrightarrow \alpha = 161,57^\circ$$

$$\Rightarrow \text{l'angle aigu} : 180^\circ - \alpha \cong \underline{18,43^\circ}$$

Ex 1.4.30

$$\left(\frac{3+1+x}{3}, \frac{1-3+y}{3} \right) \Rightarrow y=2$$

$$G(x_G; 0) \cong \Rightarrow C(x; 2)$$

$$\vec{AB} = \begin{pmatrix} -2 \\ -4 \end{pmatrix} \quad \vec{AC} = \begin{pmatrix} x-3 \\ 1 \end{pmatrix}$$

$$\text{aire du } \Delta ABC = \frac{|(-2) \cdot 1 - (-4) \cdot (x-3)|}{2} = 3 \quad \Rightarrow \quad |4x - 14| = 6$$

$$\Rightarrow 4x - 14 = \pm 6 \quad \Rightarrow \quad x_1 = 5 \quad x_2 = 2$$

$$\Rightarrow \underline{C_1(5; 2)} \quad \text{ou} \quad \underline{C_2(2; 2)}$$

Ex 1.4.31

$$\vec{OC} + \vec{CD}$$

$$\vec{AB} = \vec{DC} = \begin{pmatrix} 9 \\ 1 \end{pmatrix} \Rightarrow \vec{OD} = \vec{OC} - \vec{DC} = \begin{pmatrix} -8 \\ 4 \end{pmatrix} \Rightarrow \underline{D(-8; 4)}$$

$$\vec{AD} = \begin{pmatrix} -6 \\ 5 \end{pmatrix} \Rightarrow \det(\vec{AB}; \vec{AD}) = \begin{vmatrix} 9 & -6 \\ 1 & 5 \end{vmatrix} = 9 \cdot 5 - 1 \cdot (-6) = 51$$

$$\Rightarrow \mathcal{A} = |51| = \underline{51 u^2}$$

Ex 1.4.32

$$G(3;4) = \left(\frac{6-2+x}{3}; \frac{-1+6+y}{3} \right) = \left(\frac{4+x}{3}; \frac{5+y}{3} \right)$$

$$\Leftrightarrow \begin{cases} \frac{4+x}{3} = 3 & | \cdot 3 \\ \frac{5+y}{3} = 4 & | \cdot 3 \end{cases} \Leftrightarrow \begin{cases} 4+x = 9 \\ 5+y = 12 \end{cases} \Leftrightarrow \begin{cases} x = 5 \\ y = 7 \end{cases} \Rightarrow \underline{C(5;7)}$$

$$\vec{AB} = \begin{pmatrix} -8 \\ 7 \end{pmatrix} \text{ et } \vec{AC} = \begin{pmatrix} -1 \\ -8 \end{pmatrix} \Rightarrow \det(\vec{AB}; \vec{AC}) = -8 \cdot (-8) - 7 \cdot (-1) = 71$$

$$\Rightarrow \mathcal{A} = \frac{1}{2} \cdot |71| = \underline{\frac{71}{2}} \text{ u}^2$$

Ex 1.4.33

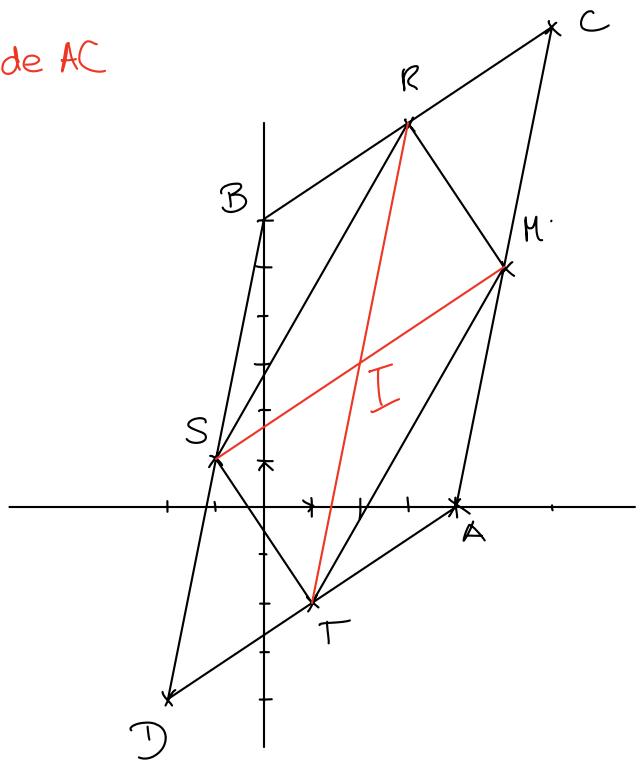
⚠ donnée H milieu de AC

$$\text{a) } M\left(\frac{4+6}{2}; \frac{0+10}{2}\right) = \underline{M(5;5)}$$

$$R\left(\frac{0+6}{2}; \frac{6+10}{2}\right) = \underline{R(3;8)}$$

$$S\left(\frac{0-2}{2}; \frac{6-4}{2}\right) = \underline{S(-1;1)}$$

$$T\left(\frac{4-2}{2}; \frac{0-4}{2}\right) = \underline{T(1;-2)}$$



b) TMRS est un // - gramme

$$\text{car } \underline{\vec{TM}} = \begin{pmatrix} 5-1 \\ 5+2 \end{pmatrix} = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$$

$$\text{et } \underline{\vec{SR}} = \begin{pmatrix} 3+1 \\ 8-1 \end{pmatrix} = \begin{pmatrix} 4 \\ 7 \end{pmatrix} \text{ sont } \underline{\text{égaux}}.$$

c) Comme TMRS est un // - gramme les diagonales se coupent en leur milieu \Rightarrow I est le milieu de TR (ou de MS)

$$\Rightarrow \underline{I\left(\frac{1+3}{2}; \frac{-2+8}{2}\right) = I(2;3)}$$