

## Exercice N°1:

1)  $|x + 3| = 2x - 1$

Condition:  $2x - 1 \geq 0 \iff x \in [\frac{1}{2}, +\infty[.$

Résolution:  $|x + 3| = 2x - 1 \iff$

$x + 3 = 2x - 1$  ou  $x + 3 = -2x + 1 \iff x = 4$  ou  $3x = -2$   
 $\iff x = 4$  ou  $x = \frac{-2}{3}$

$S_{\mathbb{R}} = \{4\}$

2)  $\sqrt{(2x - 1)^2} \leq x + 1$

Condition:  $x + 1 \geq 0 \iff x \in [-1, +\infty[.$

Résolution:  $(|2x - 1|)^2 \leq (x + 1)^2$

$\iff (2x - 1)^2 - (x + 1)^2 \leq 0$

$\iff [2x - 1 - x - 1] \times [2x - 1 + x + 1] \leq 0$

$\iff 3x(x - 2) \leq 0$

	$-\infty$	$-1$	$0$	$2$	$+\infty$
$x - 2$	-	-	0	+	+
$3x$	-	0	+	+	+
$3x(x - 2)$	+	0	-	0	+

$S_{\mathbb{R}} = ] - 1, +\infty[ \cap [0, 2] = [0, 2]$

3)  $\sqrt{\sqrt{x^2 + 3} - 4} \geq -1$

Condition:  $\sqrt{x^2 + 3} - 4 \geq 0$

$\iff \sqrt{x^2 + 3} \geq 4 \iff x^2 + 3 \geq 16 \iff x^2 \geq 13$

$\iff (x - \sqrt{13})(x + \sqrt{13}) \geq 0$



	$-\infty$	$-\sqrt{13}$	$\sqrt{13}$	$+\infty$
$x - \sqrt{13}$	-		0	+
$x + \sqrt{13}$	-	0	+	+
$(x - \sqrt{13})(x + \sqrt{13})$	+	0	-	0

$$x \in ]-\infty, -\sqrt{13}] \cup [\sqrt{13}, +\infty[$$

Résolution:  $\sqrt{\sqrt{x^2 + 3} - 4} \geq -1$  toujours vraie

$$S_{\mathbb{R}} = ]-\infty, -\sqrt{13}] \cap [\sqrt{13}, +\infty[$$

$$4) \sqrt{2}x^2 + (1 - \sqrt{2})x = 1 \iff \sqrt{2}x^2 + (1 - \sqrt{2})x - 1 = 0$$

$$a + b + c = 0 \iff x' = 1 \quad \text{ou} \quad x'' = \frac{-1}{\sqrt{2}}$$

$$S_{\mathbb{R}} = \left\{ \frac{-\sqrt{2}}{2}, 1 \right\}$$

$$5) -5x^2 + 6x + 1 = 0$$

$$\Delta = 36 + 20 + 56$$

$$x' = \frac{-6 - \sqrt{56}}{-10} = \frac{6 + \sqrt{56}}{10} \quad \text{ou} \quad x'' = \frac{-6 + \sqrt{56}}{-10} = \frac{6 - \sqrt{56}}{10}$$

$$S_{\mathbb{R}} = \left\{ \frac{6 + \sqrt{56}}{10}, \frac{6 - \sqrt{56}}{10} \right\}$$

### Exercice N°2:

$$1) a) A(x) = 3x^2 - 21x + 30$$

$$= 3(x^2 - 7x + 10)$$

$$= 3\left[\left(x - \frac{7}{2}\right)^2 - \left(\frac{7}{2}\right)^2 + 10\right]$$

$$= 3\left[\left(x - \frac{7}{2}\right)^2 - \frac{49}{4} + \frac{40}{4}\right]$$

$$= 3\left(x - \frac{7}{2}\right)^2 - \frac{27}{4}$$

$$b) \text{Min}(A(x)) = \frac{-27}{4}; \quad x = \frac{7}{2}$$



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$$\begin{aligned}
 2) \quad A(x) &= 3\left(\left(x - \frac{7}{2}\right)^2 - \frac{9}{4}\right) \\
 &= 3\left(\left(x - \frac{7}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right) \\
 &= 3\left(x - \frac{7}{2} - \frac{3}{2}\right)\left(x - \frac{7}{2} + \frac{3}{2}\right) \\
 &= 3(x-5)(x-2)
 \end{aligned}$$

$$\begin{aligned}
 3) \quad A(x) &= (x-2) \iff 3(x-5)(x-2) = (x-2) \\
 &\iff (x-2)[(3(x-5) - 1)] = 0 \\
 &\iff (x-2)(3x-16) = 0 \\
 &\iff x=2 \quad \text{ou} \quad x=\frac{16}{3} \\
 S_{\mathbb{R}} &= \left\{2, \frac{16}{3}\right\}
 \end{aligned}$$

$$\begin{aligned}
 4) \quad A(x) &= 3x^2 - 21x + 30 \\
 x' + x'' &= \frac{-b}{a} = 7 \\
 x' \times x'' &= \frac{c}{a} = 10 \\
 x'^2 + x''^2 &= \underbrace{x'^2 + x''^2 + 2x'x''}_{S^2} - 2x'x'' = S^2 - 2P = 49 - 2 \times 10 = 29
 \end{aligned}$$

### Exercice N°3:

$$\begin{aligned}
 1) \quad a) \quad \vec{AB} &\begin{pmatrix} 4 \\ -3 \end{pmatrix}; \quad \vec{AC} \begin{pmatrix} 3 \\ 4 \end{pmatrix} \\
 AB &= \sqrt{4^2 + 3^2} = 5 \\
 AC &= \sqrt{3^2 + 4^2} = 5
 \end{aligned}$$

$$b) \quad xx' + yy' = 12 - 12 = 0.$$

Par suite,  $\vec{AB} \perp \vec{AC}$ , ainsi  $(\vec{AB}, \vec{AC})$  est une base orthogonale du plan.

$$c) \quad \left. \begin{array}{l} AB = AC \\ \vec{AB} \perp \vec{AC} \end{array} \right\} \implies ABC \text{ est un triangle isocèle et rectangle en } A.$$

d)  $ABCD$  est un carré  $\iff ABC$  est isocèle et rectangle en  $A$  et  $ABCD$  est un plg.



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Donc  $ABDC$  est un carré  $\Leftrightarrow ABC\overrightarrow{AB} \perp \overrightarrow{ABDC}$  est un plg

$$\Leftrightarrow \overrightarrow{AB} + \overrightarrow{AC} = \overrightarrow{AD} \Leftrightarrow \begin{pmatrix} x_D - x_A \\ y_D - y_A \end{pmatrix} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$$

$$\begin{cases} x_D + 4 = 7 \\ y_D = 1 \end{cases} \Leftrightarrow \begin{cases} x_D = 3 \\ y_D = 1 \end{cases} \Leftrightarrow D(3, 1)$$

$$2) \text{ a) } \begin{cases} \overrightarrow{AB} = 4\vec{i} - 3\vec{j} \\ \overrightarrow{AC} = 3\vec{i} + 4\vec{j} \end{cases}$$

$$4\overrightarrow{AB} + 3\overrightarrow{AC} = 25\vec{i} \Leftrightarrow \vec{i} = \frac{4}{25}\overrightarrow{AB} + \frac{3}{25}\overrightarrow{AC}$$

$$3\overrightarrow{AB} - 4\overrightarrow{AC} = -25\vec{j} \Leftrightarrow \vec{j} = \frac{-3}{25}\overrightarrow{AB} + \frac{4}{25}\overrightarrow{AC}$$

b)  $E(25, -5)$  dans  $(O, \vec{i}, \vec{j})$ .

$$\overrightarrow{OE} = 25\vec{i} - 5\vec{j}$$

$$= 25\left(\frac{4}{25}\overrightarrow{AB} + \frac{3}{25}\overrightarrow{AC}\right) - 5\left(\frac{-3}{25}\overrightarrow{AB} + \frac{4}{25}\overrightarrow{AC}\right)$$

$$= \frac{25}{5}\overrightarrow{AB} + \frac{11}{5}\overrightarrow{AC}$$

Donc  $E\left(\frac{23}{5}, \frac{11}{5}\right)$



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