

Trigonométrie

1. Résoudre les équations suivantes :

(a) $3 \tan \theta = 2 \cos \theta$

$$\underline{\text{Si}} \tan \theta \neq 0 \Rightarrow \theta \neq \frac{\pi}{2} + k\pi$$

$$3 \frac{\sin \theta}{\cos \theta} = 2 \cos \theta$$

$$\Rightarrow 3 \sin \theta - 2 \cos^2 \theta = 0$$

$$\Rightarrow 3 \sin \theta - 2(1 - \sin^2 \theta) = 0$$

$$\Rightarrow 2 \sin^2 \theta + 3 \sin \theta - 2 = 0$$

$$\Delta = 9 + 16 = 25 \Rightarrow \sin \theta_{1,2} = \frac{-3 \pm 5}{4} \begin{cases} \frac{1}{2} \\ -2 \text{ Ar.} \end{cases}$$

$$\sin \theta = \frac{1}{2} \Leftrightarrow \begin{cases} \theta = \frac{\pi}{6} + 2k\pi \\ \theta = \frac{5\pi}{6} + 2k\pi \end{cases}$$

$$(b) \overset{x}{\sin \theta} + \overset{x}{\sin 2\theta} + \overset{x}{\sin 3\theta} + \overset{x}{\sin 4\theta} = 0$$

$$\Leftrightarrow \left(2 \sin \frac{5\theta}{2} \cos \frac{3\theta}{2} \right) + \left(2 \sin \frac{5\theta}{2} \cos \frac{\theta}{2} \right) = 0$$

$$\Leftrightarrow \cancel{2} \sin \frac{5\theta}{2} \left(\cos \frac{3\theta}{2} + \cos \frac{\theta}{2} \right) = 0$$

$$\Leftrightarrow \sin \frac{5\theta}{2} \cancel{2} \cos \theta \cos \frac{\theta}{2} = 0$$

$$\Leftrightarrow \begin{cases} \sin \frac{5\theta}{2} = 0 \Leftrightarrow \frac{5\theta}{2} = k\pi \Leftrightarrow \theta = \frac{2k\pi}{5} \\ \cos \theta = 0 \Leftrightarrow \theta = \frac{\pi}{2} + k\pi \\ \cos \frac{\theta}{2} = 0 \Leftrightarrow \frac{\theta}{2} = \frac{\pi}{2} + k\pi \Leftrightarrow \theta = \pi + 2k\pi \end{cases}$$

$$CE: \theta \neq \frac{\pi}{2} + k\pi, \theta \neq \frac{\pi}{8} + k\frac{\pi}{4}$$

$$(c) \tan 4\theta = 4 \tan \theta \quad (1)$$

$$\begin{aligned} \tan 4\theta &= \frac{2 \tan 2\theta}{1 - \tan^2 2\theta} = \frac{2 \frac{2 \tan \theta}{1 - \tan^2 \theta}}{1 - \left(\frac{2 \tan \theta}{1 - \tan^2 \theta} \right)^2} \\ &= \frac{4 \tan \theta}{1 - \tan^2 \theta} \\ &= \frac{4 \tan \theta}{1 - 2 \tan^2 \theta + \tan^4 \theta - 4 \tan^2 \theta} \\ &= \frac{4 \tan \theta (1 - \tan^2 \theta)^2}{(1 - \tan^2 \theta)^2} \\ &= \frac{4 \tan \theta (1 - \tan^2 \theta)^2}{(1 - \tan^2 \theta)(\tan^4 \theta - 6 \tan^2 \theta + 1)} \end{aligned}$$

$$(1) \Leftrightarrow \frac{4 \tan \theta (1 - \tan^2 \theta)}{\tan^4 \theta - 6 \tan^2 \theta + 1} - 4 \tan \theta = 0$$

$$\Leftrightarrow \tan \theta \left[\frac{1 - \tan^2 \theta}{1} - 1 \right] = 0$$

$$\Leftrightarrow \tan \theta (1 - \tan^2 \theta - \tan^4 \theta + 6 \tan^2 \theta - 1) = 0$$

$$\Leftrightarrow \tan \theta (-\tan^4 \theta + 5 \tan^2 \theta) = 0$$

$$\Leftrightarrow \tan^3 \theta (5 - \tan^2 \theta) = 0$$

$$\Leftrightarrow \begin{cases} \tan \theta = 0 & \Leftrightarrow \theta = k\pi \\ 5 - \tan^2 \theta = 0 & \Leftrightarrow \tan \theta = \pm \sqrt{5} \end{cases}$$

$$\Leftrightarrow \theta = \pm 1,15 + k\pi$$

$$(d) \cos x = \sin \frac{\pi}{8}$$

$$\Leftrightarrow x = \cos^{-1} \frac{3\pi}{8} \quad \left(\frac{\pi}{2} - \frac{\pi}{8} \right)$$

$$\Leftrightarrow \begin{cases} x = \frac{3\pi}{8} + 2k\pi \\ x = -\frac{3\pi}{8} + 2k\pi \end{cases}$$

$$(e) \sin\left(3x + \frac{\pi}{3}\right) = \sin\left(\frac{2\pi}{3} - x\right)$$

$$\Leftrightarrow \begin{cases} 3x + \frac{\pi}{3} = \frac{2\pi}{3} - x + 2k\pi \\ 3x + \frac{\pi}{3} = \pi - \left(\frac{2\pi}{3} - x\right) + 2k\pi \end{cases}$$

$$\Leftrightarrow \begin{cases} 4x = \frac{\pi}{3} + 2k\pi \\ 2x = 2k\pi \end{cases}$$

$$\Leftrightarrow \begin{cases} x = \frac{\pi}{12} + \frac{k\pi}{2} \\ x = k\pi \end{cases}$$

$$(f) 2\sin^2 x + \sin x - 1 = 0$$

$$\Delta = 1 + 8 = 9$$

$$\sin x_{1,2} = \frac{-1 \pm 3}{4} \begin{cases} \frac{1}{2} \\ -1 \end{cases}$$

$$\sin x = \frac{1}{2} \Leftrightarrow$$

$$x = \frac{\pi}{6} + 2k\pi$$

$$x = \frac{5\pi}{6} + 2k\pi$$

$$\sin x = -1 \Leftrightarrow$$

$$x = \frac{3\pi}{2} + 2k\pi$$

$$(g) \sin 2x = \tan x$$

$$\underline{CE}: x \neq \frac{\pi}{2} + k\pi$$

$$2 \sin x \cos x = \frac{\sin x}{\cos x}$$

$$\Leftrightarrow 2 \sin x \cos^2 x - \sin x = 0$$

$$\Leftrightarrow \sin x (2 \cos^2 x - 1) = 0$$

$$\Leftrightarrow \begin{cases} \sin x = 0 & \Leftrightarrow x = k\pi \end{cases}$$

$$\begin{cases} 2 \cos^2 x - 1 = 0 & \Leftrightarrow \cos x = \pm \frac{\sqrt{2}}{2} \end{cases}$$

$$\Leftrightarrow \begin{cases} x = \pm \frac{\pi}{4} + 2k\pi \\ x = \pm \frac{3\pi}{4} + 2k\pi \end{cases}$$

$$S: \left\{ 0, \frac{\pi}{4}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{7\pi}{4} \right\} + 2k\pi$$

$$(h) \cos 2x = \sin x$$

$$\Leftrightarrow 1 - 2 \sin^2 x - \sin x = 0$$

$$\Leftrightarrow -2 \sin^2 x - \sin x + 1 = 0$$

$$\Delta = 1 + 8 = 9 \quad \sin x_{1/2} = \frac{1 \pm 3}{-4} \begin{cases} -1 \\ \frac{1}{2} \end{cases}$$

$$\sin x = -1 \Leftrightarrow x = \frac{3\pi}{2} + 2k\pi$$

$$\sin x = \frac{1}{2} \Leftrightarrow \begin{cases} x = \frac{\pi}{6} + 2k\pi \\ x = \frac{5\pi}{6} + 2k\pi \end{cases}$$

$$(i) \frac{1 + \sin x}{1 - \sin x} = 3$$

$$\underline{CE} : 1 - \sin x \neq 0 \Leftrightarrow x \neq \frac{\pi}{2} + 2k\pi$$

$$\Leftrightarrow 1 + \sin x = 3 - 3 \sin x$$

$$\Leftrightarrow 4 \sin x - 2 = 0 \Leftrightarrow \sin x = \frac{1}{2}$$

$$\Leftrightarrow \begin{cases} x = \frac{\pi}{6} + 2k\pi \\ x = \frac{5\pi}{6} + 2k\pi \end{cases}$$

$$(j) \sin 2x \tan x - \tan x - \sin 2x + 1 = 0$$

$$\underline{CE}: x \neq \frac{\pi}{2} + k\pi$$

$$\Leftrightarrow \tan x (\sin 2x - 1) - (\sin 2x - 1) = 0$$

$$\Leftrightarrow (\sin 2x - 1)(\tan x - 1) = 0$$

$$\Leftrightarrow \begin{cases} \sin 2x = 1 & \Leftrightarrow 2x = \frac{\pi}{2} + 2k\pi \\ & \Leftrightarrow x = \frac{\pi}{4} + k\pi \\ \tan x = 1 & \Leftrightarrow x = \frac{\pi}{4} + k\pi \end{cases}$$

$$(k) \sin x + \cos x = \frac{\sqrt{2}}{2}$$

On utilise les formules en $\tan \frac{x}{2}$ démontrées
ou cours

Si on pose $t = \tan \frac{x}{2}$

$$\Rightarrow \frac{2t}{1+t^2} + \frac{1-t^2}{1+t^2} = \frac{\sqrt{2}}{2}$$

$$\Leftrightarrow 2t + 1 - t^2 - \frac{\sqrt{2}}{2} (1+t^2) = 0$$

$$\Leftrightarrow 4t + 2 - 2t^2 - \sqrt{2} - \sqrt{2}t^2 = 0$$

$$\Leftrightarrow -(2+\sqrt{2})t^2 + 4t + (2-\sqrt{2}) = 0$$

$$\Delta = 16 + 4(2+\sqrt{2})(2-\sqrt{2})$$

$$= 24$$

$$t_{1,2} = \frac{-4 \pm 2\sqrt{6}}{-2(2+\sqrt{2})} = -\sqrt{2} + 2 \pm (\sqrt{6} - \sqrt{3})$$

$$\bullet t_1 = \dots \Leftrightarrow \frac{x}{2} = -\frac{\pi}{24} + k\pi$$

$$\Leftrightarrow x = -\frac{\pi}{12} + 2k\pi$$

$$\bullet t_2 = \dots \Leftrightarrow \frac{x}{2} = \frac{7\pi}{24} + k\pi$$

$$\Leftrightarrow x = \frac{7\pi}{12} + 2k\pi$$

$$(1) 2 \sin z + 3 \cos z = 1$$

De même qu'à l'exercice précédent:

$$\frac{4t}{1+t^2} + 3 \frac{1-t^2}{1+t^2} = 1$$

$$\Leftrightarrow 4t + 3 - 3t^2 - 1 - t^2 = 0$$

$$\Leftrightarrow -4t^2 + 4t + 2 = 0$$

$$\Delta = 16 + 32 = 48$$

$$t_{1,2} = \frac{-4 \pm 4\sqrt{3}}{-8} = \frac{1 \pm \sqrt{3}}{2}$$

$$t_1 = \frac{1+\sqrt{3}}{2}$$

$$\Leftrightarrow \frac{\pi}{2} = 0,94 + k\pi$$

$$\Leftrightarrow \pi = 1,88 + 2k\pi$$

$$t_2 = \frac{1-\sqrt{3}}{2}$$

$$\Leftrightarrow \frac{\pi}{2} = -0,35 + k\pi$$

$$\Leftrightarrow \pi = -1,7 + 2k\pi$$

2. Résoudre les inéquations suivantes :

(a) $\cos \theta + \cos(\theta + \pi/3) > 0$

$$\Leftrightarrow 2 \cos \frac{\theta + \theta + \frac{\pi}{3}}{2} \cos \left(-\frac{\pi}{6}\right) > 0$$

$$\Leftrightarrow \cos \left(\theta + \frac{\pi}{6}\right) > 0$$

$$\Leftrightarrow -\frac{\pi}{2} < \theta + \frac{\pi}{6} < \frac{\pi}{2}$$

$$\Leftrightarrow -\frac{2\pi}{3} < \theta < \frac{\pi}{3}$$

$$S: \left] -\frac{2\pi}{3}, \frac{\pi}{3} \right[+ 2k\pi$$

$$(b) 2 \cos \theta + \sin \theta < 2$$

$$t = \tan \frac{x}{2}$$

$$\cancel{2} \frac{1-t^2}{1+t^2} + \frac{\cancel{2}t}{1+t^2} < \cancel{2}$$

$$\Leftrightarrow 1 - t^2 + t < 1 + t^2$$

$$\Leftrightarrow -2t^2 + t < 0$$

t	0	$\frac{1}{2}$	
I_n	-	+	-

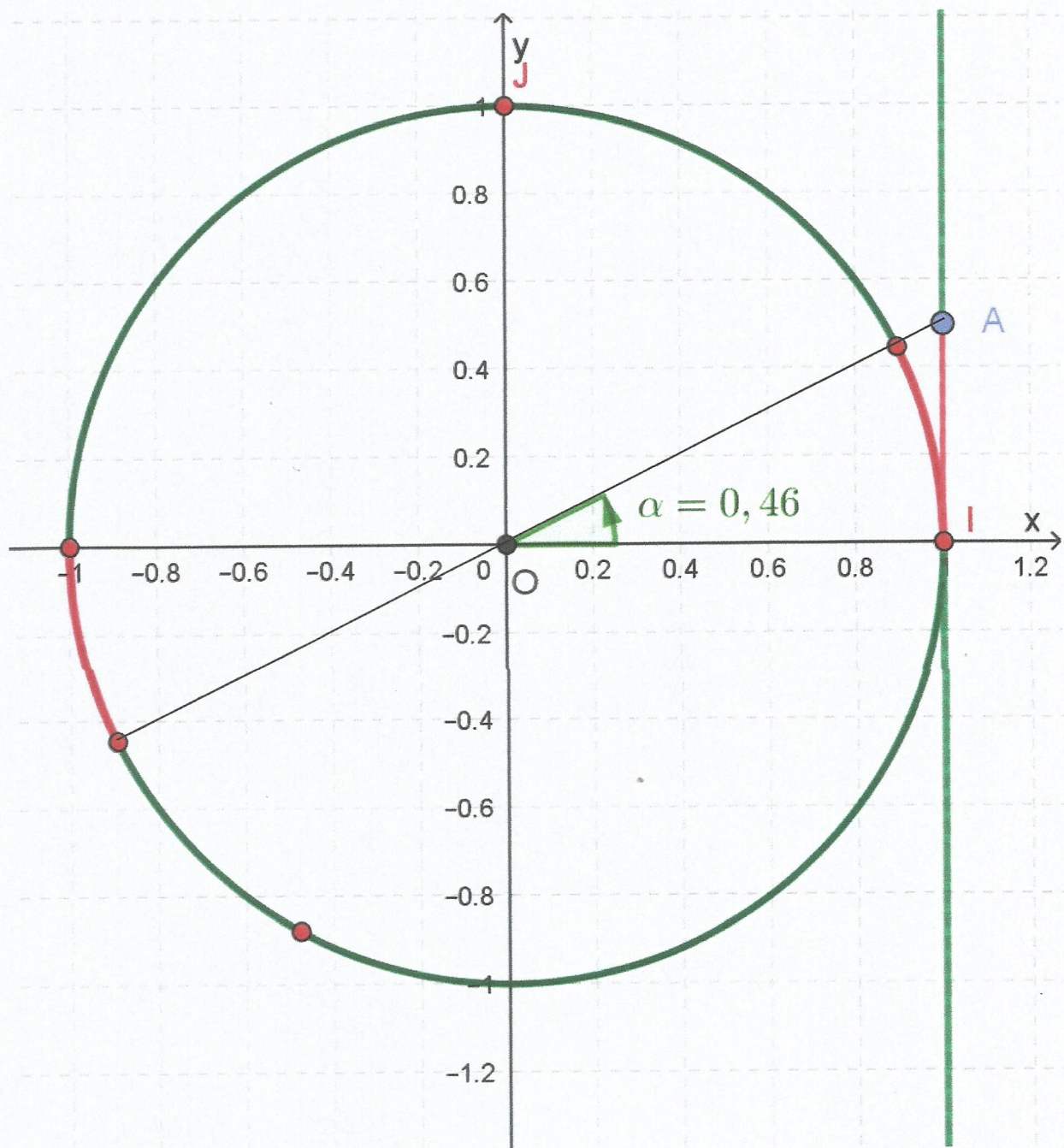
$$t \in -\infty, 0[\cup]\frac{1}{2}, +\infty$$

$$\tan \frac{x}{2} \in -\infty, 0[\cup]\frac{1}{2}, +\infty$$

$\Rightarrow$ Cercle : voir page suivante

$$\Rightarrow \frac{x}{2} \in]0,46; \frac{\pi}{2}[\cup]\frac{\pi}{2}, \pi[+ k\pi$$

$$\Leftrightarrow x \in]0,93; \pi[\cup]\pi, 2\pi[+ 2k\pi$$



$$(c) 2 \cos^2 x + \cos x < 0$$

$$\Leftrightarrow \cos x (2 \cos x + 1) < 0$$

$$x = \frac{\pi}{2} + k\pi$$

$$x = \pm \frac{2\pi}{3} + 2k\pi$$

x	$-\pi$	$-\frac{2\pi}{3}$	$-\frac{\pi}{2}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	π
$\cos x$	-	-	0	+	0	-
$2\cos x + 1$	-	0	+	+	0	-
I_n	+	0	-	0	+	0

$$S :] -\frac{2\pi}{3}, -\frac{\pi}{2} [\cup] \frac{\pi}{2}, \frac{2\pi}{3} [+ 2k\pi$$

$$(d) 2 \sin x + 3 \cot x > 0$$

$$CE: x \neq k\pi$$

$$\Leftrightarrow 2 \sin x + 3 \frac{\cos x}{\sin x} > 0$$

$$\Leftrightarrow \frac{2 \sin^2 x + 3 \cos x}{\sin x} > 0$$

$$\Leftrightarrow \frac{2(1 - \cos^2 x) + 3 \cos x}{\sin x} > 0$$

$$\Leftrightarrow \frac{-2 \cos^2 x + 3 \cos x + 2}{\sin x} > 0$$

Zeile: $N: \Delta = 9 + 16 = 25 \quad \cos x_{1,2} = \frac{-3 \pm 5}{-4} \begin{cases} -\frac{1}{2} \\ 2 \end{cases} \quad (*)$

$$(*) x = \pm \frac{2\pi}{3} + 2k\pi$$

Le numérateur se factorise en $-2(\cos x + \frac{1}{2})(\cos x - 2)$

$$D: \sin x \leq 0 \Leftrightarrow x = k\pi$$

x	$-\pi$	$-\frac{2\pi}{3}$	0	$\frac{2\pi}{3}$	π
$\cos x + \frac{1}{2}$	-	0	+	+	-
$-2(\cos x - 2)$	+	+	+	+	+
$\sin x$	0	-	-	+	0
I_n	0	+	0	-	0

$$S:]-\pi, -\frac{2\pi}{3}[\cup]0, \frac{2\pi}{3}[+ 2k\pi$$

$$(e) \tan x \cot 2x > \tan 2x \cot x$$

$$CE: x \neq \frac{\pi}{2} + k\pi, x \neq \frac{\pi}{4} + \frac{k\pi}{2}$$

$$x \neq k\pi, x \neq \frac{3\pi}{2}$$

$$\Leftrightarrow \frac{\sin x}{\cos x} \frac{\cos 2x}{\sin 2x} - \frac{\sin 2x}{\cos 2x} \frac{\cos x}{\sin x} > 0$$

$$\Leftrightarrow \frac{\sin^2 x \cos^2 2x - \sin^2 2x \cos^2 x}{\sin x \cos x \sin 2x \cos 2x} > 0$$

$$\Leftrightarrow \frac{(\sin x \cos 2x - \sin 2x \cos x)(--- + ---)}{D} > 0$$

$$\Leftrightarrow \frac{\sin(x - 2x) \sin(x + 2x)}{D} > 0$$

$$\Leftrightarrow \frac{+ \cancel{\sin x} \sin 3x}{\cancel{\sin x} \cos x \sin 2x \cos 2x} < 0$$

$$\Leftrightarrow \frac{\sin 3x}{\cos x \sin 2x \cos 2x} < 0$$

$$\text{Zeros: } \sin 3x = 0 \Leftrightarrow 3x = k\pi \Leftrightarrow x = \frac{k\pi}{3} \quad (1)$$

$$D: \cos x = 0 \Leftrightarrow x = \frac{\pi}{2} + k\pi \quad (2)$$

$$\sin 2x = 0 \Leftrightarrow 2x = k\pi \Leftrightarrow x = \frac{k\pi}{2} \quad (3)$$

$$\cos 2x = 0 \Leftrightarrow 2x = \frac{\pi}{2} + k\pi \Leftrightarrow x = \frac{\pi}{4} + \frac{k\pi}{2} \quad (4)$$

$$(1) -\pi, -\frac{2\pi}{3}, -\frac{\pi}{3}, 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi$$

$$(2) \pm \frac{\pi}{2}$$

$$(3) -\pi, -\frac{\pi}{2}, 0, \frac{\pi}{2}, \pi$$

$$(4) -\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{4}, \frac{3\pi}{4}$$

x	$-\pi$	$-\frac{3\pi}{4}$	$-\frac{2\pi}{3}$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	π
$\sin 3x$	0	-	-	0	+	+	0	-	-	0	+	+	0
$\cos x$	-	-	-	0	+	+	+	+	+	0	-	-	-
$\sin 2x$	0	+	+	0	-	-	0	+	+	+	0	-	0
$\cos 2x$	+	0	-	-	-	-	0	+	0	-	-	-	0
I_n	+	+	-	0	+	+	0	-	+	-	0	+	+

$$S:]-\frac{3\pi}{4}, -\frac{2\pi}{3}[\cup]-\frac{\pi}{3}, -\frac{\pi}{4}[\cup]\frac{\pi}{4}, \frac{\pi}{3}[\cup]\frac{2\pi}{3}, \frac{3\pi}{4}[+ 2k\pi$$

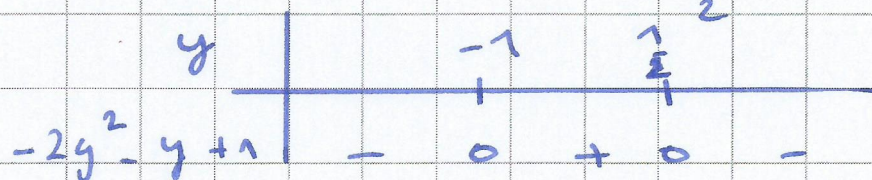
$$(f) \cos 2x > \sin x$$

$$\Leftrightarrow 1 - 2\sin^2 x - \sin x > 0$$

$$y = \sin x$$

$$\Delta = 1 + 8 = 9$$

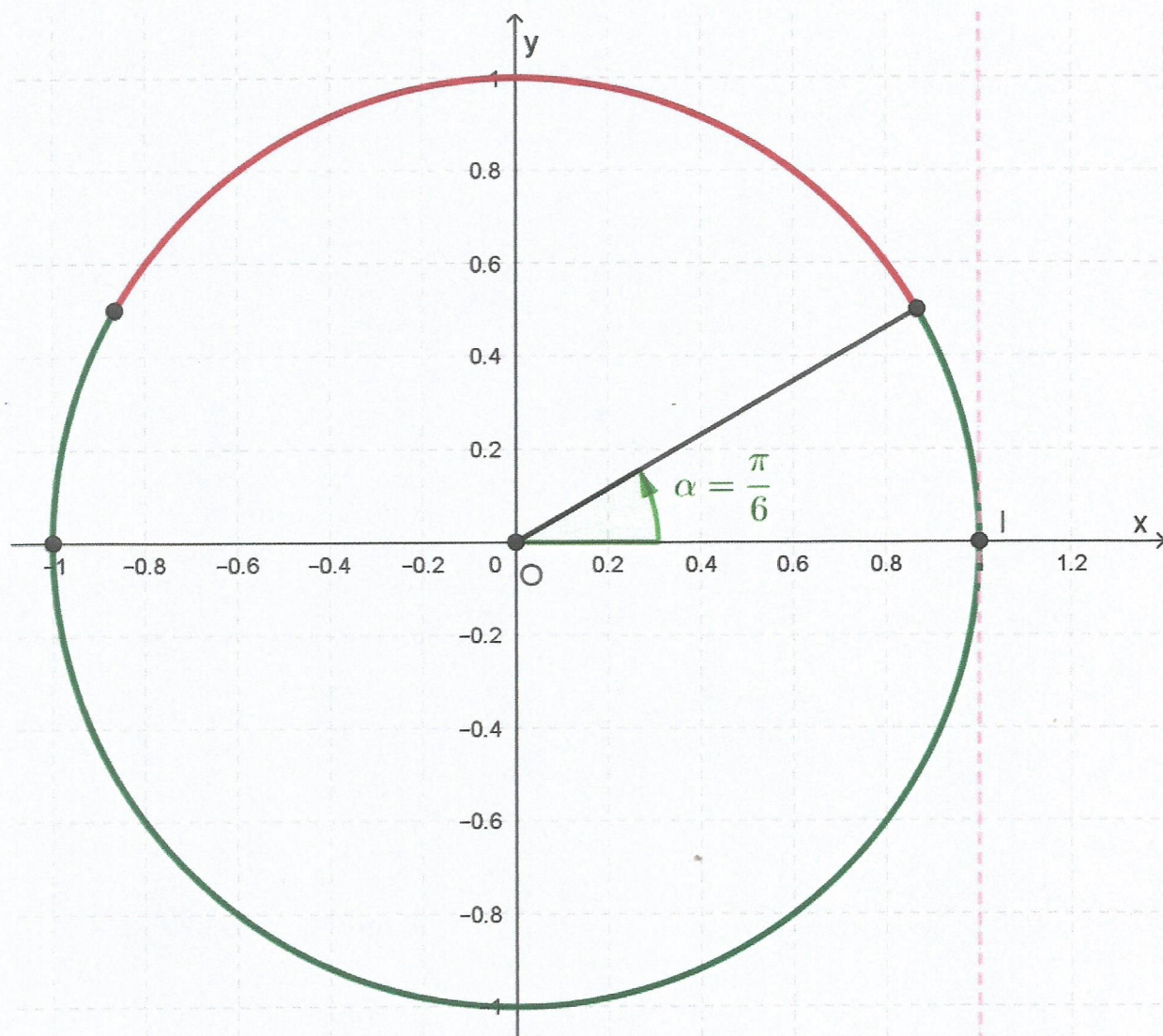
$$y_{1,2} = \frac{1 \pm 3}{-4} \begin{matrix} -1 \\ \frac{1}{2} \end{matrix}$$



$$y \in]-1, \frac{1}{2}[$$

→ Cercle : cf page suivante

$$S :]-\pi, \frac{\pi}{6}[\cup]\frac{5\pi}{6}, \pi] + 2k\pi$$



$$(g) \cos x + \cos 3x \geq 0$$

$$2 \cos 2x \cos x \geq 0$$

3^o caso: $\cos 2x = 0 \Leftrightarrow 2x = \frac{\pi}{2} + k\pi$
 $\Leftrightarrow x = \frac{\pi}{4} + \frac{k\pi}{2}$

$$\cos x = 0 \Leftrightarrow x = \frac{\pi}{2} + k\pi$$

x	$-\pi$	$-\frac{3\pi}{4}$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π			
$\cos 2x$	+	0	-	-	0	+	+	0	-	-	0	+
$\cos x$	-	-	0	+	+	+	+	0	-	-	0	+
I_x	-	0	+	0	-	0	+	+	0	-	0	+

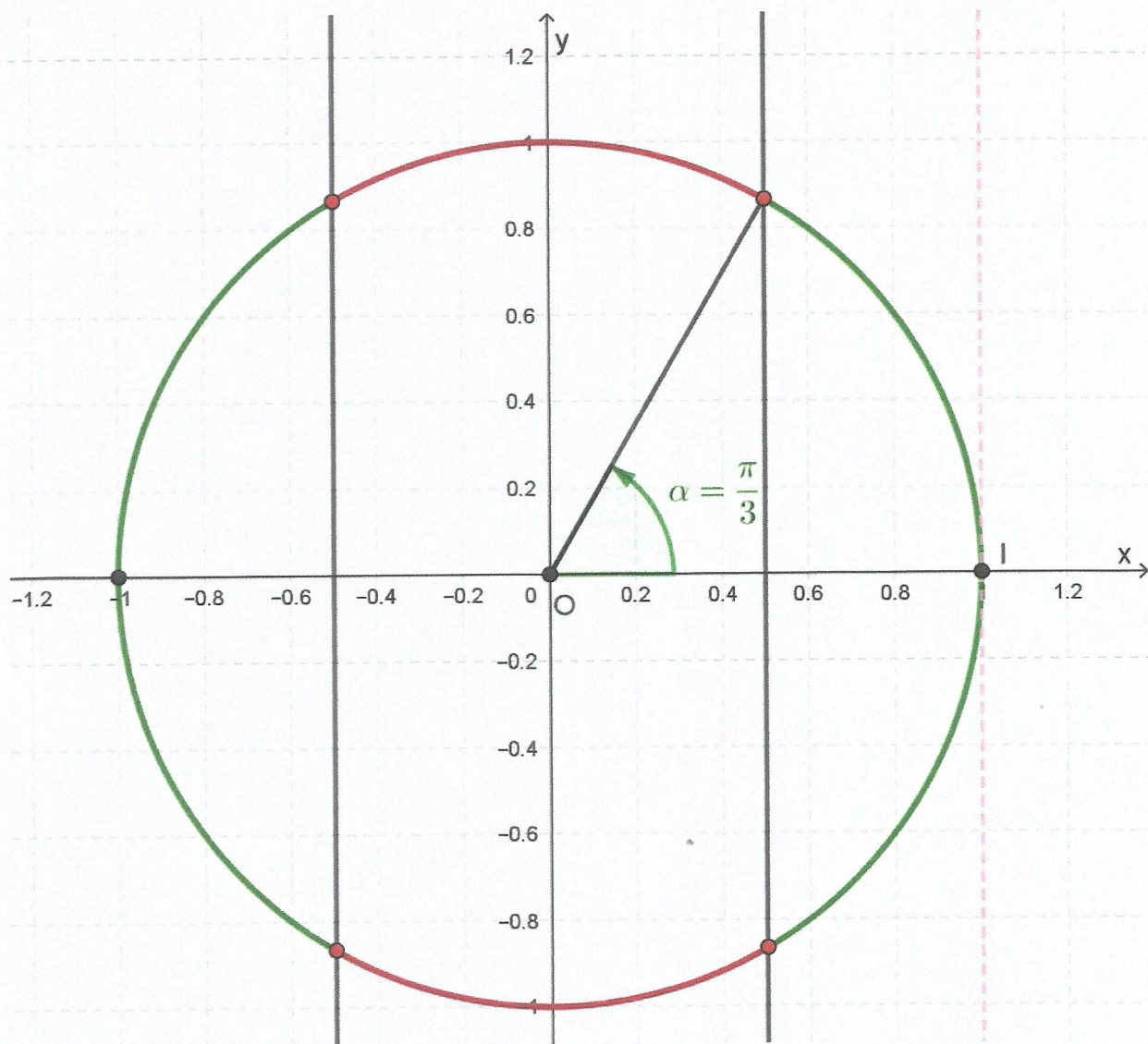
$$S: \left[-\frac{3\pi}{4}, -\frac{\pi}{2}\right] \cup \left[-\frac{\pi}{4}, \frac{\pi}{4}\right] \cup \left[\frac{\pi}{2}, \frac{3\pi}{4}\right] + 2k\pi$$

$$(h) 2|\cos t| - 1 > 0$$

$$\Leftrightarrow |\cos t| > \frac{1}{2} \quad \Leftrightarrow \begin{cases} \cos t < -\frac{1}{2} \\ \cos t > \frac{1}{2} \end{cases}$$

Cercle $\rightarrow$ cf page suivante

$$S : \left[-\pi, -\frac{2\pi}{3}\right[\cup \left[-\frac{\pi}{3}, \frac{\pi}{3}\right[\cup \left[\frac{2\pi}{3}, \pi\right[+ 2k\pi$$



$$(i) \frac{2 \sin^2 x}{2 \sin^2 x - 1} + 1 > 0$$

$$\Leftrightarrow \frac{2 \sin^2 x + 2 \sin^2 x - 1}{2 \sin^2 x - 1} > 0$$

$$\Leftrightarrow \frac{4 \sin^2 x - 1}{2 \sin^2 x - 1} > 0$$

zéros: N: $\sin^2 x = \frac{1}{4} \Leftrightarrow \sin x = \pm \frac{1}{2}$

$$\Leftrightarrow \begin{cases} x = \pm \frac{\pi}{6} + 2k\pi \\ x = \pm \frac{5\pi}{6} + 2k\pi \end{cases}$$

D: $\sin^2 x = \frac{1}{2} \Leftrightarrow \sin x = \pm \frac{\sqrt{2}}{2}$

$$\Leftrightarrow \begin{cases} x = \pm \frac{\pi}{4} + 2k\pi \\ x = \pm \frac{3\pi}{4} + 2k\pi \end{cases}$$

x	$-\pi$	$-\frac{5\pi}{6}$	$-\frac{3\pi}{4}$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	
N	-	0	+	+	+	0	-	0	+	+	0	-
D	-	-	0	+	0	-	-	-	0	+	0	-
T_m	+	0	-	+	+	0	+	0	-	+	+	0

S: $[-\pi, -\frac{5\pi}{6}] \cup [-\frac{3\pi}{4}, -\frac{\pi}{4}] \cup [-\frac{\pi}{2}, \frac{\pi}{2}] \dots$

$\dots \cup [\frac{\pi}{4}, \frac{3\pi}{4}] \cup [\frac{5\pi}{6}, \pi] + 2k\pi$

$$(j) \frac{2 \sin 2x - 1}{\cos 2x - 3 \cos x + 2} \geq 0$$

zéro: N: $2 \sin 2x = 1 \Leftrightarrow \sin 2x = \frac{1}{2}$

$$\Leftrightarrow \begin{cases} 2x = \frac{\pi}{6} + 2k\pi \\ 2x = \frac{5\pi}{6} + 2k\pi \end{cases}$$

$$\Leftrightarrow \begin{cases} x = \frac{\pi}{12} + k\pi \quad (1) \\ x = \frac{5\pi}{12} + k\pi \quad (2) \end{cases}$$

Donc $[-\pi, \pi[$: (1) $\frac{\pi}{12}, -\frac{11\pi}{12}$ (2) $\frac{5\pi}{12}, -\frac{7\pi}{12}$

D: $\cos 2x - 3 \cos x + 2 = 0$

$$\Leftrightarrow 2 \cos^2 x - 1 - 3 \cos x + 2 = 0$$

$$\Leftrightarrow 2 \cos^2 x - 3 \cos x + 1 = 0$$

$$\Delta = 1, \cos x_{1,2} = \frac{3 \pm 1}{4} < \frac{1}{2}$$

$$\cos x = 1 \Leftrightarrow x = 2k\pi$$

$$\cos x = \frac{1}{2} \Leftrightarrow x = \pm \frac{\pi}{3} + 2k\pi$$

x	$-\pi$	$-\frac{11\pi}{12}$	$-\frac{7\pi}{12}$	$-\frac{\pi}{3}$	0	$\frac{\pi}{12}$	$\frac{\pi}{3}$	$\frac{5\pi}{12}$	π				
U	/	-	0	+	0	-	-	0	+	0	-		
$\cos x$ (*)	/	-	-	-	0	-	-	-	-	-	-		
$\cos x - \frac{1}{2}$	/	-	-	-	0	+	+	0	-	-	-		
I_n	/	-	0	+	0	-	+	+	0	-	+	0	-

$$S: \left[-\frac{11\pi}{12}, -\frac{7\pi}{12}\right] \cup \left] -\frac{\pi}{3}, 0 \right[\cup \left] 0, \frac{\pi}{12} \right[\cup \left] \frac{\pi}{3}, \frac{5\pi}{12} \right[+ 2k\pi$$

(*) cf remarque faite en cours

$$(k) \sin 3x - \sin 2x + \sin x \geq 0$$

$$(2 \sin 2x \cos x) - \sin 2x \geq 0$$

$$\sin 2x (2 \cos x - 1) \geq 0$$

$$2x = k\pi$$

$$x = \frac{k\pi}{2}$$

$$\cos x = \frac{1}{2} \Leftrightarrow x = \pm \frac{\pi}{3} + 2k\pi$$

x	$-\pi$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	0	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π
$\sin 2x$	0	+	0	-	0	+	0
$2\cos x - 1$	-	-	0	+	+	0	-
I_x	0	-	0	+	0	+	0

$$S: \left[-\frac{\pi}{2}, -\frac{\pi}{3}\right] \cup \left[0, \frac{\pi}{3}\right] \cup \left[\frac{\pi}{2}, \pi\right] + 2k\pi$$