

10 Solutions

1 La mesure des angles

1.1

a) 30° ; b) 480° ; c) -45° ; d) $\sim 28,6^\circ$.

1.2

a) $\frac{\pi}{4}$; b) $-\frac{\pi}{12}$; c) $\frac{13\pi}{4}$; d) $\frac{\pi}{3}$.

1.3

a) oui ; b) non ; c) oui ; d) non ; e) oui ; f) oui.

1.4

$\frac{2\pi}{5}$, $\frac{3\pi}{10}$ et $\frac{3\pi}{10}$.

1.5

a) $L = 16$ cm et $A = 192$ cm² ; b) $L \cong 8,38$ cm et $A \cong 100,53$ cm².

1.6

La distance entre les points A et B est d'environ 221,66 km.

1.7

En une seconde, la Terre tourne d'environ $7,29 \cdot 10^{-5}$ radians.

1.8

a) $\frac{4}{5}$ tours/minute ; b) 96π radians/minute ; c) $\frac{8\pi}{5}$ radians/seconde ; d) 288° /seconde.

1.9

509,30 tours/minutes.

2 Le triangle rectangle

2.1

a) $\beta = 58^\circ$, $AC \cong 8,48$, $AB \cong 5,30$; b) $\gamma = 58^\circ$, $AC \cong 2,65$, $AB \cong 4,24$; c) $\beta = 63^\circ$, $BC \cong 22,03$, $AC \cong 19,63$; d) $\beta \cong 30,96^\circ$, $\gamma \cong 59,04^\circ$, $BC \cong 11,66$; e) $\beta = 26^\circ$, $BC \cong 27,37$, $AB \cong 24,60$; f) $\gamma = 45^\circ$, $AC \cong 8,49$, $AB \cong 8,49$.

2.2

Le clocher mesure $\sim 27,62$ m.

2.3

Il faut parcourir 2'721,03 m.

2.4

Le rayon mesure $\sim 6,39$ m et la hauteur de la voûte est de $\sim 8,57$ m.

2.5

Le périmètre mesure $35,27$ cm et l'aire est de $85,6$ cm².

2.6

Le rayon est de $\sim 22,62$ cm.

2.7

La hauteur du bâtiment est de $\sim 13,36$ m.

2.8

Elle le voit sous un angle de $\sim 20,27^\circ$.

2.9

La hauteur du jet d'eau est ~ 221 m.

2.10

$BC \cong 78,50$ cm, $CH \cong 69,95$ cm, $HA \cong 18,16$ cm.

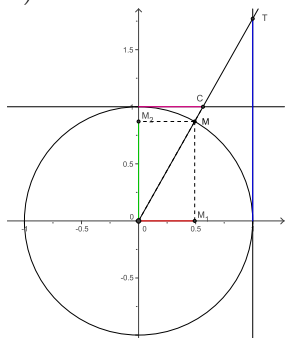
2.11

a) $\widehat{JAI} \cong 41,81^\circ$, $\widehat{JAB} \cong 48,19^\circ$, $\widehat{JAD} \cong 70,53^\circ$; b) $\sim 10,39$ cm.

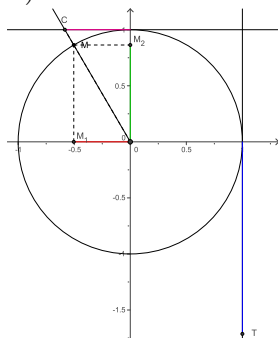
3 Rapports trigonométriques d'un angle

3.1

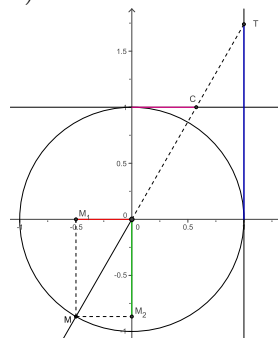
a)



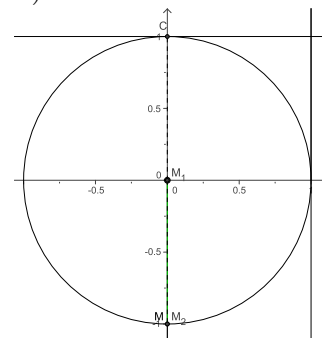
b)



c)



d)

**3.2**

a) IV; b) III; c) III; d) II; e) I; f) II.

4 Relations trigonométriques

4.1
 $\cos(\alpha) = -\frac{4}{5} ; \tan(\alpha) = -\frac{3}{4} ; \cot(\alpha) = -\frac{4}{3} .$

4.2
 $\cos(\beta) = \frac{12}{13} ; \sin(\beta) = -\frac{5}{13} ; \cot(\beta) = -\frac{12}{5} .$

4.3
 $\sin(\gamma) = \frac{3}{4} ; \tan(\gamma) = -\frac{3}{\sqrt{7}} ; \cot(\gamma) = -\frac{\sqrt{7}}{3} .$

4.4
 -

4.5
 a) $\cos(120^\circ) = -\frac{1}{2}, \sin(120^\circ) = \frac{\sqrt{3}}{2}, \tan(120^\circ) = -\sqrt{3}, \cot(120^\circ) = -\frac{1}{\sqrt{3}} ;$

b) $\cos(-150^\circ) = -\frac{\sqrt{3}}{2}, \sin(-150^\circ) = -\frac{1}{2}, \tan(-150^\circ) = \frac{1}{\sqrt{3}}, \cot(-150^\circ) = \sqrt{3} ;$

c) $\cos(225^\circ) = -\frac{1}{\sqrt{2}}, \sin(225^\circ) = -\frac{1}{\sqrt{2}}, \tan(225^\circ) = 1, \cot(225^\circ) = 1 ;$

d) $\cos\left(\frac{3\pi}{4}\right) = -\frac{1}{\sqrt{2}}, \sin\left(\frac{3\pi}{4}\right) = \frac{1}{\sqrt{2}}, \tan\left(\frac{3\pi}{4}\right) = -1, \cot\left(\frac{3\pi}{4}\right) = -1 ;$

e) $\cos\left(-\frac{\pi}{3}\right) = \frac{1}{2}, \sin\left(-\frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}, \tan\left(-\frac{\pi}{3}\right) = -\sqrt{3}, \cot\left(-\frac{\pi}{3}\right) = -\frac{1}{\sqrt{3}} ;$

f) $\cos\left(\frac{5\pi}{6}\right) = -\frac{\sqrt{3}}{2}, \sin\left(\frac{5\pi}{6}\right) = \frac{1}{2}, \tan\left(\frac{5\pi}{6}\right) = -\frac{1}{\sqrt{3}}, \cot\left(\frac{5\pi}{6}\right) = -\sqrt{3} .$

4.6

a) $\sin(t)$; b) $\cot(t)$; c) $\cos(t)$; d) $\tan(t)$; e) $\cos(t)$; f) $-\sin(t)$; g) $-\sin(t)$; h) $\cot(t)$;
 i) 0 ; j) $-2\cos(t)$; k) $\sin(t)$; l) $-\cot(t)$.

5 Le triangle quelconque

5.1

	a	b	c	α	β	γ	$\mathcal{A}$
a)	5	6	7	44,4	57,1	78,5	14,7
b)	5	7	8,7 / 2,8	35	53,4 / 126,6	91,6 / 18,4	17,49 / 5,53
c)	4	9	7,4	26,0	100,0	54	14,56
d)	5,9	9,1	8	40	80	60	23,39
e)	6	5	5,0 / 9,8	73,7 / 29,2	53,1 / 24,0	53,1 / 126,9	12
f)	5,5	4	5,3	70	43,6	66,4	10

5.2

a) $c = 18,6$, $\alpha = 10,1^\circ$, $\gamma = 155,9^\circ$; b) $a = 18,2/2,2$, $\alpha = 130,8^\circ/5,3^\circ$, $\beta = 27,3^\circ/152,8^\circ$; c) impossible.

5.3

$BC = 63,8$ cm; $BD = 25,4$ cm; $AD = 56,5$ cm; $AC = 88$ cm.

5.4

Le rayon mesure $13,2$.

5.5

Aire = $23,7$; $\beta = 101,3^\circ$; $\gamma = 67,3^\circ$; $\delta = 81,4^\circ$.

5.6

$BC = 15,3$

5.7

Le satellite se trouve à $1'487,2$ km de l'observateur.

5.8

L'altitude du sommet C est $1224,1$ m.

5.9

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6 Fonctions trigonométriques**6.1**

$f \longleftrightarrow d$, $g \longleftrightarrow b$, $h \longleftrightarrow a$, $i \longleftrightarrow c$.

6.2

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

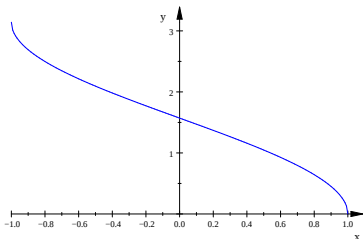
x	0	π	2π		
$\sin(x)$	0	+	0	-	0

x	0	$\frac{\pi}{2}$	π
$\tan(x)$	0	+	-

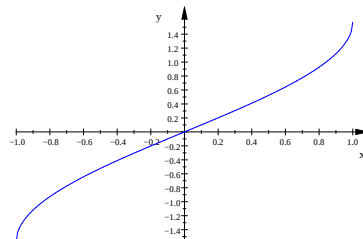
x	0	$\frac{\pi}{2}$	π		
$\cot(x)$		+	0	-	

6.3

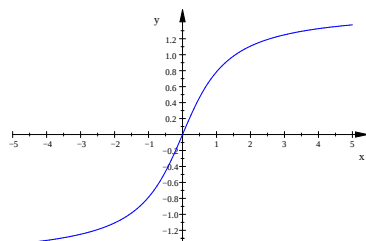
$$\arccos : [-1; 1] \longrightarrow [0; \pi]$$



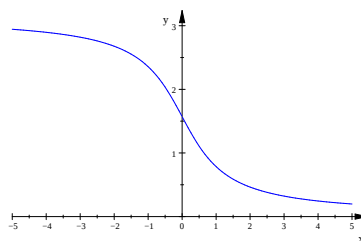
$$\arcsin : [-1; 1] \longrightarrow \left[-\frac{\pi}{2}; \frac{\pi}{2}\right]$$



$$\arctan : \mathbb{R} \longrightarrow \left]-\frac{\pi}{2}; \frac{\pi}{2}\right[$$



$$\operatorname{arccot} : \mathbb{R} \longrightarrow]0; \pi[$$



6.4

a) oui, $p=6\pi$; b) oui, $p=\pi$; c) oui, $p=2\pi$; d) oui, $p=2\pi$; e) non périodique ; f) oui, $p=\pi$.

6.5

a) 8π ; b) π ; c) $\frac{2\pi}{3}$; d) non périodique ; e) 10π ; f) $\frac{\pi}{8}$; g) 2π ; h) 2π ; i) 7π .

7 Formules trigonométriques

7.1

$$\cos(75^\circ) = \frac{\sqrt{6} - \sqrt{2}}{4}, \quad \sin(75^\circ) = \frac{\sqrt{6} + \sqrt{2}}{4}, \quad \tan(75^\circ) = \frac{\sqrt{3} + 3}{3 - \sqrt{3}}, \quad \cot(75^\circ) = \frac{3 - \sqrt{3}}{\sqrt{3} + 3},$$

$$\cos(15^\circ) = \frac{\sqrt{6} + \sqrt{2}}{4}, \quad \sin(15^\circ) = \frac{\sqrt{6} - \sqrt{2}}{4}, \quad \tan(15^\circ) = \frac{3 - \sqrt{3}}{3 + \sqrt{3}}, \quad \cot(15^\circ) = \frac{3 + \sqrt{3}}{3 - \sqrt{3}}.$$

7.2

$$\cos(22,5^\circ) = \frac{1}{2}\sqrt{\sqrt{2} + 2}, \quad \sin(22,5^\circ) = \frac{1}{2}\sqrt{2 - \sqrt{2}}, \quad \tan(22,5^\circ) = \sqrt{\frac{2 - \sqrt{2}}{2 + \sqrt{2}}}, \quad \cot(22,5^\circ) = \sqrt{\frac{2 + \sqrt{2}}{2 - \sqrt{2}}}.$$

7.3

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8 Equations trigonométriques

8.1

$$\text{a) } x = \pm 120^\circ + k \cdot 360^\circ ; \text{ b) } t \cong \begin{cases} 57,9^\circ + k \cdot 360^\circ \\ 122,1^\circ + k \cdot 360^\circ \end{cases} ; \text{ c) } t \cong -42,1^\circ + k \cdot 180^\circ ;$$

$$\text{d) } t \cong 49,6^\circ + k \cdot 180^\circ ; \text{ e) } t = \begin{cases} \frac{11\pi}{8} + k \cdot 3\pi \\ -\frac{5\pi}{8} + k \cdot 3\pi \end{cases} ; \text{ f) } t = \begin{cases} \frac{3\pi}{2} + k \cdot 4\pi \\ \frac{2}{5\pi} + k \cdot 4\pi \end{cases} ;$$

$$\text{g) } x \cong -3,5^\circ + k \cdot 60^\circ ; \text{ h) } t \cong 2,8 + k \cdot \frac{3\pi}{2} .$$

8.2

$$\text{a) } x = \begin{cases} 22,5^\circ + k \cdot 90^\circ \\ 45^\circ + k \cdot 180^\circ \end{cases} ; \text{ b) } t = \frac{2\pi}{9} + k \cdot \frac{\pi}{3} ; \text{ c) } t = \begin{cases} \frac{5\pi}{26} + k \cdot \frac{12\pi}{13} \\ \frac{\pi}{34} + k \cdot \frac{12\pi}{17} \end{cases} ; \text{ d) } t = 45^\circ + k \cdot 90^\circ .$$

8.3

$$\text{a) } x = \begin{cases} \frac{\pi}{2} + k \cdot \frac{12\pi}{7} \\ \frac{2}{7\pi} + k \cdot \frac{13}{12\pi} \end{cases} ; \text{ b) } x = \frac{15\pi}{31} + k \cdot \frac{24\pi}{31} ; \text{ c) } t = \begin{cases} -\frac{3\pi}{7} + k \cdot \frac{12\pi}{9} \\ \frac{\pi}{13} + k \cdot \frac{12\pi}{13} \end{cases} ;$$

$$\text{d) } x = -75^\circ + k \cdot 90^\circ .$$

8.4

$$\text{a) } x = \begin{cases} k \cdot 2\pi \\ \pm \frac{\pi}{3} + k \cdot 2\pi \end{cases} ; \text{ b) } x = \begin{cases} 30^\circ + k \cdot 360^\circ \\ 150^\circ + k \cdot 360^\circ \end{cases} ; \text{ c) } t = \begin{cases} \pm \frac{\pi}{3} + k \cdot 2\pi \\ \pm \frac{2\pi}{3} + k \cdot 2\pi \end{cases} ;$$

$$\text{d) } x = \begin{cases} \pm 45^\circ + k \cdot 180^\circ \\ \pm 60^\circ + k \cdot 180^\circ \end{cases} ; \text{ e) } t = \begin{cases} \pm \frac{\pi}{4} + k \cdot 2\pi \\ \pm \frac{3\pi}{4} + k \cdot 2\pi \end{cases} ; \text{ f) } t \cong \begin{cases} -45^\circ + k \cdot 180^\circ \\ 76,0^\circ + k \cdot 180^\circ \end{cases} .$$

8.5

$$\text{a) } x \cong \begin{cases} 71,56^\circ + k \cdot 180^\circ \\ -45^\circ + k \cdot 180^\circ \end{cases} ; \text{ b) } x \cong \begin{cases} -1,4 + k \cdot \pi \\ \frac{\pi}{4} + k \cdot \pi \end{cases} ; \text{ c) } x \cong \begin{cases} 45^\circ + k \cdot 180^\circ \\ 26,6^\circ + k \cdot 180^\circ \end{cases} ;$$

$$\text{d) } x \cong \begin{cases} \frac{\pi}{4} + k \cdot \pi \\ 1,0 + k \cdot \pi \end{cases} ; \text{ e) } x \cong \begin{cases} 180^\circ + k \cdot 360^\circ \\ 102,6^\circ + k \cdot 360^\circ \end{cases} ; \text{ f) } t \cong \begin{cases} -0,4 + k \cdot \frac{\pi}{3} \\ \frac{\pi}{12} + k \cdot \frac{\pi}{3} \end{cases} .$$

8.6

$$\text{a) } x = \begin{cases} \frac{\pi}{2} + k \cdot \pi \\ \frac{\pi}{6} + k \cdot 2\pi \\ \frac{5\pi}{6} + k \cdot 2\pi \end{cases} ; \text{ b) } t = \pm 120^\circ + k \cdot 360^\circ ; \text{ c) } x = \frac{\pi}{4} + k \cdot \frac{\pi}{2} ;$$

$$\text{d) } t = \begin{cases} 67,5 + k \cdot 180^\circ \\ -22,5^\circ + k \cdot 180^\circ \end{cases} ; \text{ e) } x = 45^\circ + k \cdot 90^\circ ; \text{ f) } x \cong \begin{cases} -0,4 + k \cdot 2\pi \\ 3,5 + k \cdot 2\pi \end{cases} .$$

8.7

$$\alpha = 90^\circ, \beta = 60^\circ, \gamma = 30^\circ, a = 4, b = 2\sqrt{3}, c = 2 .$$