

Antwoorden goniometrische en cyclometrische functies

1) Radialen

- 1) (A)
- 2) (A)
- 3) a) $\frac{\pi}{12} \text{ rad}$ b) $\frac{5\pi}{4} \text{ rad}$ c) $0,21960 \text{ rad}$ d) $-0,35576 \text{ rad}$
e) 135° f) -72° g) $57^\circ 17' 45''$ h) $-151^\circ 35' 25''$
- 4) a) $125^\circ = \frac{25}{36} \pi \text{ rad}$ b) $10\pi \text{ cm}$ en $\frac{5\pi}{8} \text{ cm}$ c) $29''$ d) $1:05:27$
- 5) a) $187^\circ 30'$ b) 48 rondjes
- 6) (A)
- 7) (A)
- 8) $4709,47 \text{ km}$

2) De goniometrische getallen (herhaling)

- 1) (A)
- 2) $\cos 3 < \cos 4 < \cos 2 < \cos 5 < \cos 1$
- 3) (E)
- 4) (A)
- 5) (C)
- 6) (C)
- 7) (E)
- 8) (C)
- 9) (E)
- 10) (A)
- 11) (D)
- 12) (A)
- 13) (D)
- 14) (D)
- 15) (D)
- 16) (D)
- 17) (E)
- 18) (C) (C) (E)
- 19) (A)
- 20) (C)
- 21) (D)
- 22) $\tan x = 3/4$

3) De goniometrische functies

- 1) $P_1 = 2, P_2 = 3, P_3 = 4, P_4 = 6$
- 2) a) 60 b) 6π
- 3) $f(x) = \sin(2x) + \sin(\pi x)$
- 4) (B)
- 5) (D)
- 6) (B)
- 7) (C)

8) (C)

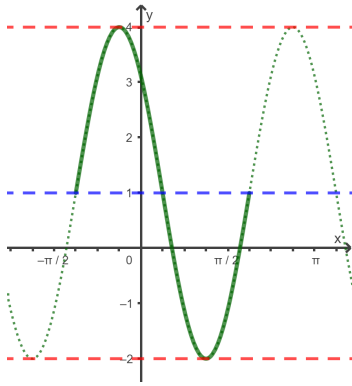
9) (A)

10) (C)

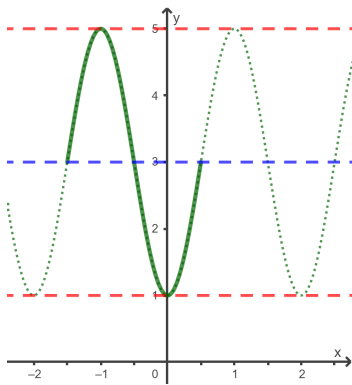
11) (C)

12) (B)

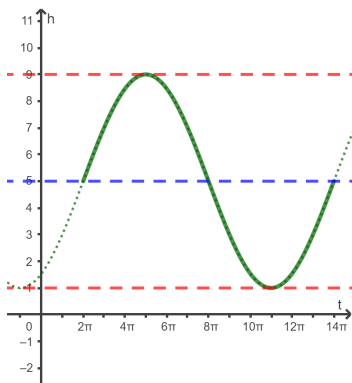
13) a) $f(x) = 3 \sin\left(2\left(x + \frac{3\pi}{8}\right)\right)$



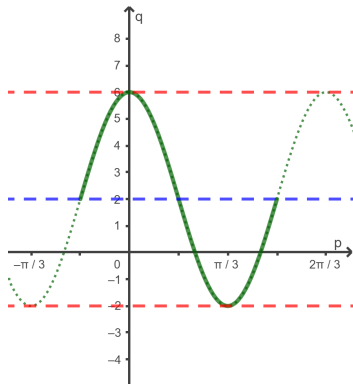
b) $f(x) = 3 + 2 \sin\left(\pi\left(x + \frac{3}{2}\right)\right)$



c) $h(t) = 5 + 4 \sin\left(\frac{1}{6}(t - 2\pi)\right)$



d) $q(p) = 2 + 4 \sin\left(3\left(p + \frac{\pi}{6}\right)\right)$



14) (C)

15) $f_1(x) = 3 \sin\left(2\left(x - \frac{\pi}{8}\right)\right) + 1$

$f_2(x) = 4 \sin\left(\frac{1}{2}\left(x + \frac{3\pi}{4}\right)\right) + 2$

$f_3(x) = 2 \sin\left(\frac{\pi}{4}(x-1)\right) - 3$

16) a) $A\left(\frac{9\pi}{4}, -2\right)$, $B\left(\frac{\pi}{4}, 2\right)$, $C\left(\frac{7\pi}{4}, -1\right)$ en $D\left(\frac{3\pi}{4}, 1\right)$

b) $A, B, C, D \in r \leftrightarrow y = -\frac{2}{\pi}x + \frac{5}{2}$

17) $g(x) = -8 \cdot x(x^2 - 1)$

18) a) $d = 5,2 \cdot \sin\left(\frac{\pi}{6} \cdot (t-4)\right) + 12,28$ b) $d \approx 5,15 \cdot \sin(0,51 \cdot t - 1,83) + 12,17$

19) a) 46,3 cm b) 1,085 m

20) a) $m \leftrightarrow y = \frac{23}{2} \cdot \sin\left(\frac{2\pi}{103}\left(x - \frac{103}{4}\right)\right) + \frac{29}{2}$

b) $w \leftrightarrow y = -0,0001175x^2 + 7,5$ c) 29,95 m

21) a) 36,97 m b) $h_2(x) = 6,25 + 6,25 \cdot \sin\left(\frac{2\pi}{51}\left(x - \frac{291}{4}\right)\right)$ c) 13,9 m

22) (D)

23) (B)

24) (B)

4) Goniometrie

a) De formules

De som- en verschilformules

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

$\cot 15^\circ = 2 + \sqrt{3}$, $\sec 15^\circ = \sqrt{6} - \sqrt{2}$, $\csc 15^\circ = \sqrt{6} + \sqrt{2}$

2) $\frac{\pi}{6}$

3) 0

4) $\tan \widehat{BDC} = \frac{15}{53}$

5) (B)

6) $|DE| = \frac{28}{3}$

7) 45° 8) De verdubbelings- en halveringsformules

1) a) $\frac{\sqrt{3}}{8}$ b) $-\frac{\sqrt{3}}{2}$

2) (C)

3) 

4) (B)

5) $|BD| = \frac{75}{7}$

6) 

7) a) $A\left(\frac{\pi}{8}, \frac{2+\sqrt{2}}{2}\right)$ b) $\vec{v}\left(\frac{\pi}{4}, 0\right)$ c) $a = \frac{\pi}{4}$

8) 3π

9) a) $\text{bld } f =]-\infty, -1/2] \cup [1/2, +\infty[$ b) $|a| < 1 \Leftrightarrow -1 < a < 1$

10) 

11) a) $\theta = \frac{2k\pi}{7}$ b) $a = 8, b = 4, c = -4$ en $d = -1$.

De formules van Simpson


1) a) $\sqrt{2}$ b) 0 c) $\sqrt{2}$ d) $\sqrt{3}$


2) 

3) $p(x) = \frac{1}{2} \sin 2x$ $s(x) = \sqrt{2} \cdot \sin\left(x + \frac{\pi}{4}\right)$

4) $h(x) = \frac{\sqrt{3}}{2} \cdot \sin\left(x + \frac{\pi}{6}\right)$.

5) 13 keer

6) a)  b) $\frac{1}{8}$

7) a)  b) $\cos 36^\circ = \frac{1+\sqrt{5}}{4}$

8) 9) De t-formules

1) a) $\sqrt{2}$ b) $\frac{3}{10}$

2) (C)

Alle formules samen

1) $\sin \alpha = \frac{3}{5}$

2) $\frac{\pi}{8}$ 3) a) $\frac{1}{8}$ b) 1 c) $\frac{\sqrt{3}+1}{2}$ d) 44) $\frac{\pi}{8}$ 5) bld $f = \left[\frac{3}{4}, 1 \right]$ 6) q 7) a) $(0,0)$, $(0,\sqrt{3})$, $(0,-\sqrt{3})$, $(2,0)$ en $(-1,0)$ b) $(-1,1)$ en $(-1,-1)$ 8) a) $\frac{\pi}{8}$ b) $\hat{A} = 60^\circ$ 9) $\hat{A} = 90^\circ$, $\hat{B} = 30^\circ$ en $\hat{C} = 60^\circ$..10) $\frac{\pi}{8}$ 11) a) $\frac{\pi}{8}$ b) $\tan \frac{\hat{A}}{2} = \frac{\sqrt{7}}{7}$ 12) a) $\widehat{ECD} = \frac{\alpha - \beta}{2}$ b) $\frac{\pi}{8}$ **b) Goniometrische vergelijkingen en ongelijkheden**Vergelijkingen die te herleiden zijn naar basisvergelijkingen

1) 2

2) a) $V = \left\{ k\pi, \frac{\pi}{4} + k \cdot \frac{\pi}{2} \mid k \in \mathbb{Z} \right\}$ b) $V = \left\{ -3 + 2k\pi, \frac{1}{3} + \frac{2k\pi}{3} \mid k \in \mathbb{Z} \right\}$ c) $V = \left\{ \frac{\pi}{4} + k\pi \mid k \in \mathbb{Z} \right\}$ d) $V = \left\{ \frac{\pi}{9} + \frac{2k\pi}{3}, 2k\pi \mid k \in \mathbb{Z} \right\}$ e) $V = \left\{ \frac{\pi}{6} + k \cdot \frac{\pi}{3} \mid k \in \mathbb{Z} \right\}$ f) $V = \left\{ \frac{\pi}{3} + \frac{2k\pi}{3}, -\pi + 2k\pi \mid k \in \mathbb{Z} \right\}$ 3) a) $V = \left\{ \frac{3\pi}{20} + k\pi, \frac{7\pi}{20} + k\pi \mid k \in \mathbb{Z} \right\}$ b) $V = \left\{ \frac{\pi}{6} + 2k\pi, -\frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi, -\frac{5\pi}{6} + 2k\pi \mid k \in \mathbb{Z} \right\}$ c) $V = \left\{ \frac{2\pi}{9} + \frac{1}{3} + \frac{2k\pi}{3}, -\frac{2\pi}{9} + \frac{1}{3} + \frac{2k\pi}{3} \mid k \in \mathbb{Z} \right\}$ d) $V = \left\{ \frac{\pi}{3} + k\pi \mid k \in \mathbb{Z} \right\}$ e) $V = \left\{ -\frac{\pi}{16} + k \cdot \frac{\pi}{2}, \frac{5\pi}{16} + k \cdot \frac{\pi}{2} \mid k \in \mathbb{Z} \right\}$ f) $V = \{2k\pi \mid k \in \mathbb{Z}\}$

4) (A)

Vergelijkingen die uiteenvallen in basisvergelijkingen1) a) $V = \left\{ k\pi, -\frac{\pi}{18} + \frac{2k\pi}{3}, -\frac{5\pi}{18} + \frac{2k\pi}{3} \mid k \in \mathbb{Z} \right\}$ b) $V = \left\{ \frac{\pi}{4} + k \cdot \frac{\pi}{2}, \frac{\pi}{3} + 2k\pi, -\frac{\pi}{3} + 2k\pi \mid k \in \mathbb{Z} \right\}$ c) $V = \left\{ \frac{\pi}{2} + 2k\pi, \frac{2\pi}{3} + 2k\pi, -\frac{2\pi}{3} + 2k\pi \mid k \in \mathbb{Z} \right\}$

$$d) V = \left\{ \frac{\pi}{2} + k\pi, \frac{\pi}{8} + k \cdot \frac{\pi}{2} \mid k \in \mathbb{Z} \right\}$$

$$2) (A) -\sqrt{3}/2$$

Vergelijkingen waar een substitutie hulp kan bieden

$$1) a) V = \{ \pi + 2k\pi \mid k \in \mathbb{Z} \}$$

$$b) V = \left\{ -\frac{\pi}{6} + 2k\pi, -\frac{5\pi}{6} + 2k\pi \mid k \in \mathbb{Z} \right\}$$

$$c) V = \left\{ -\frac{\pi}{6} + k\pi, \frac{\pi}{4} + k\pi \mid k \in \mathbb{Z} \right\}$$

$$d) V = \left\{ -\frac{\pi}{2} + 2k\pi, \frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi \mid k \in \mathbb{Z} \right\}$$

$$e) V = \left\{ \frac{\pi}{2} + k\pi \mid k \in \mathbb{Z} \right\}$$

$$f) V = \left\{ \frac{\pi}{3} + k\pi, \frac{\pi}{6} + k\pi, \text{Bgtan}\left(-\frac{\sqrt{3}}{2}\right) + k\pi \mid k \in \mathbb{Z} \right\}$$

$$g) V = \left\{ \frac{\pi}{4} + k\pi \mid k \in \mathbb{Z} \right\}$$

$$h) V = \left\{ \frac{\pi}{4} + 2k\pi, \frac{-5\pi}{12} + 2k\pi, \frac{-13\pi}{12} + 2k\pi \mid k \in \mathbb{Z} \right\}$$

$$2) (C)$$

$$3) V = \{0, \pi, 2\pi\}$$

$$4) (B)$$

Lineaire vergelijkingen in sinus en cosinus

$$1) a) V = \left\{ \frac{-\pi}{12} + 2k\pi, \frac{5\pi}{12} + 2k\pi \mid k \in \mathbb{Z} \right\} \quad b) V = \left\{ -\frac{\pi}{2} + 2k\pi, 2 \cdot \text{Bgtan}\left(-\frac{1}{5}\right) + 2k\pi \mid k \in \mathbb{Z} \right\}$$

$$c) V = \emptyset \quad d) V = \{2 \cdot \text{Bgtan}(-3) + 2k\pi, x = \pi + 2k\pi \mid k \in \mathbb{Z}\}$$

$$2) \text{ Voor 6 waarden}$$

Homogene vergelijkingen in sinus en cosinus

$$1) a) V = \left\{ \frac{\pi}{2} + k\pi, \frac{\pi}{4} + k\pi, \text{Bgtan}\frac{1}{2} + k\pi \mid k \in \mathbb{Z} \right\}$$

$$b) V = \left\{ \frac{1}{2} \cdot \text{Bgtan}\left(1 + \frac{\sqrt{6}}{2}\right) + k \cdot \frac{\pi}{2}, \frac{1}{2} \cdot \text{Bgtan}\left(1 - \frac{\sqrt{6}}{2}\right) + k \cdot \frac{\pi}{2} \mid k \in \mathbb{Z} \right\}$$

$$c) V = \left\{ \frac{\pi}{2} + k\pi, \frac{\pi}{4} + k\pi, \frac{\pi}{6} + k\pi, \frac{-\pi}{6} + k\pi \mid k \in \mathbb{Z} \right\} \quad d) V = \left\{ \frac{\pi}{3} + k\pi, \frac{\pi}{12} + k\pi, \frac{-5\pi}{12} + k\pi \mid k \in \mathbb{Z} \right\}$$

$$2) a) V = \left\{ \text{Bgtan}\left(\pm(1 \pm \sqrt{2})\right) + k\pi \mid k \in \mathbb{Z} \right\} \quad b) V = \left\{ \frac{\pi}{8} + k \cdot \frac{\pi}{4} \mid k \in \mathbb{Z} \right\}$$

Gemengde opgaven

$$1) a) V = \left\{ \frac{\pi}{6} + k \cdot \frac{\pi}{3}, -\frac{\pi}{4} + k \cdot \frac{\pi}{2} \mid k \in \mathbb{Z} \right\} \quad b) V = \left\{ k \cdot \frac{\pi}{3} \mid k \in \mathbb{Z} \right\}$$

$$c) V = \left\{ k\pi, \frac{\pi}{6} + k\pi, -\frac{\pi}{6} + k\pi \mid k \in \mathbb{Z} \right\} \quad d) V = \left\{ -\frac{\pi}{4} + k\pi, \pi + 2k\pi \mid k \in \mathbb{Z} \right\}$$

$$e) V = \left\{ \frac{\pi}{4} + 2k\pi \mid k \in \mathbb{Z} \right\} \quad f) V = \left\{ \frac{\pi}{4} + k\pi, \text{Bgtan}\left(\frac{-1}{5}\right) + k\pi \mid k \in \mathbb{Z} \right\}$$

$$g) V = \left\{ \frac{\pi}{8} + k \cdot \frac{\pi}{4} \mid k \in \mathbb{Z} \right\} \quad h) V = \left\{ \frac{2k\pi}{3}, \frac{\pi}{3} + 2k\pi \mid k \in \mathbb{Z} \right\}$$

- 2) $\alpha \in \left\{ \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$
- 3) $V = \left\{ \frac{-\pi}{72} + k \cdot \frac{\pi}{6}, \frac{-5\pi}{72} + k \cdot \frac{\pi}{6} \mid k \in \mathbb{Z} \right\}$
- 4) $V = \{(1/2, -1/2), (-1/2, 1/2), (1, 0), (-1, 0), (0, 1), (0, -1)\}$
- 5) $\hat{R} = 30^\circ$
- 6) $a + b + c = 37$
- 7) $t = \frac{2\pi}{3}$
- 8) $V = \left\{ \frac{\pi}{2} + k\pi, \frac{\pi}{3} + k\pi \mid k \in \mathbb{Z} \right\}$
- 9) (D)

Goniometrische ongelijkheden

- 1) a) $V = \bigcup_{k \in \mathbb{Z}} \left[-\frac{\pi}{6} + 2k\pi, \frac{\pi}{6} + 2k\pi \right]$ b) $V = \bigcup_{k \in \mathbb{Z}}]\pi + 4k\pi, 4\pi + 4k\pi[$
- c) $V = \bigcup_{k \in \mathbb{Z}} \left[-\frac{\pi}{4} + k\frac{\pi}{2}, \frac{\pi}{12} + k\frac{\pi}{2} \right[$
- d) $V = \bigcup_{k \in \mathbb{Z}} \left[\frac{-\pi}{8} + k\pi, \frac{\pi}{8} + k\pi \right[\cup \bigcup_{k \in \mathbb{Z}} \left] \frac{3\pi}{8} + k\pi, \frac{5\pi}{8} + k\pi \right[$
- e) $V = \bigcup_{k \in \mathbb{Z}} \left[-\frac{3\pi}{8} + k\frac{\pi}{2}, \frac{-\pi}{6} + k\frac{\pi}{2} \right[$ f) $V = \bigcup_{k \in \mathbb{Z}} \left] -\frac{\pi}{12} + k\pi, \frac{\pi}{12} + k\pi \right[$
- g) $V = \bigcup_{k \in \mathbb{Z}} \left[-\frac{3\pi}{4} + 2k\pi, -\frac{\pi}{4} + 2k\pi \right[\cup \bigcup_{k \in \mathbb{Z}} \left] 2k\pi, \frac{\pi}{4} + 2k\pi \right[\cup \bigcup_{k \in \mathbb{Z}} \left] \frac{3\pi}{4} + 2k\pi, \pi + 2k\pi \right[$
- h) $V = \left\{ \frac{\pi}{2} + k\pi \mid k \in \mathbb{Z} \right\}$
- 2) a) 5 uur en 38 minuten b) 8,61 m
- 3) $V = \left] B \operatorname{gsin} \left(\frac{-1 + \sqrt{5}}{2} \right), \frac{\pi}{4} \right[$
- 4) \emptyset

5) Cyclometrische functies

- 1) a) $\pi/3$ b) $2\pi/3$ c) $-\pi/3$ d) $\frac{-\pi}{2}$
- 2) a) $-\frac{\pi}{5}$ b) $\frac{6\pi}{7}$ c) $\frac{2\pi}{9}$
- 3) \emptyset
- 4) a) $\operatorname{dom} f =]-\infty, 0] \cup \left[\frac{2}{3}, +\infty \right[$ b) $\operatorname{dom} f = [-\sqrt{3}, +\infty[$
- 5) a) $\frac{3\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{3\pi}{4}$
- 6) a) $V = \left\{ \frac{1}{2} \right\}$ b) $V = \left\{ \frac{4}{5} \right\}$ c) $V = \left\{ \frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2} \right\}$