

UITWERKINGEN VOOR HET VWO

A1B1 DEEL1

Hoofdstuk 10

HELLINGEN

KERN 1

GEMIDDELDE VERANDERING

1a) $2,4 \text{ cm} \leftrightarrow 60 \text{ cent} \Rightarrow 1 \text{ cm} \leftrightarrow \frac{60}{2,4} \text{ cent}$

$$\left. \begin{array}{l} 1975 \quad 0,7 \cdot \frac{60}{2,4} \simeq 18 \text{ ct} \\ 1985 \quad 2,3 \cdot \frac{60}{2,4} \simeq 58 \text{ ct} \end{array} \right\} \Rightarrow 58 - 18 = 40 \text{ ct}$$

1b) Gemiddelde Prijsstijging = $\frac{40 \text{ cent}}{10 \text{ jaar}} = 4 \text{ cent / jaar}$

2a) $\frac{\Delta y}{\Delta x} = \frac{f(4) - f(1)}{4 - 1} = \frac{16 - 7}{3} = 3$

2a) $\frac{\Delta y}{\Delta x} = \frac{f(3) - f(-2)}{3 - (-2)} = \frac{14 - 4}{5} = 2$

2a) $\frac{\Delta y}{\Delta x} = \frac{f(4) - f(\frac{1}{4})}{4 - \frac{1}{4}} = \frac{\frac{1}{4} - 4}{3\frac{3}{4}} = \frac{-3\frac{3}{4}}{3\frac{3}{4}} = -1$

3a) 12 kilometer in 36 minuten \Rightarrow

$$\Rightarrow \frac{12}{36} \text{ km/min} \Rightarrow \frac{12}{36} \cdot 60 \text{ km/uur} \Rightarrow 20 \text{ km/uur}$$

3b) 4 kilometer in 10 minuten $\Rightarrow 24 \text{ km/uur}$

4a)

$$0,6 \text{ cm} \Leftrightarrow 100 \text{ (dagproductie)}$$

$$1 \text{ cm} \Leftrightarrow \frac{100}{0,6}$$

$$0,18 \cdot \frac{100}{0,6} = 30 \text{ per } 10 \text{ werknemers} \Rightarrow \frac{30}{10} = 3 \text{ per werknemer}$$

4b)

$$100 \text{ per } 20 \text{ werknemers} \Rightarrow \frac{100}{20} = 5 \text{ per werknemer}$$

$$208 \text{ per } 30 \text{ werknemers} \Rightarrow \frac{208}{30} = \pm 7 \text{ per werknemer}$$

$$325 \text{ per } 40 \text{ werknemers} \Rightarrow \frac{325}{40} = \pm 8 \text{ per werknemer (8,1)}$$

$$383 \text{ per } 45 \text{ werknemers} \Rightarrow \frac{1383}{45} = \pm 9 \text{ per werknemer (8,5)}$$

$$417 \text{ per } 50 \text{ werknemers} \Rightarrow \frac{417}{50} = \pm 8 \text{ per werknemer (8,3)}$$

Dus bij ± 45 werknemers

5a) $H = 2 \cdot 0,95^t$

t	0	1	2	3	4	5	6	7	8	9	10
H	2	1,9	1,805	1,715	1,629	1,548	1,47	1,397	1,327	1,26	1,197
ΔH		-0,1	-0,095	-0,09	-0,086	-0,081	-0,078	-0,073	-0,07	-0,067	-0,063

5b) $\frac{2 - 1,55}{5} = 0,09 \text{ mg/uur}$

¹ Deze samenvatting mag niet massaal op kosten van Schaersvoorde worden Uitgeprint!!!



2

werd gemaakt onder Linux met \LaTeX en \LaTeX

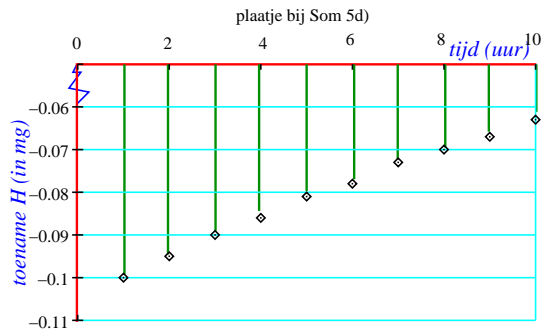
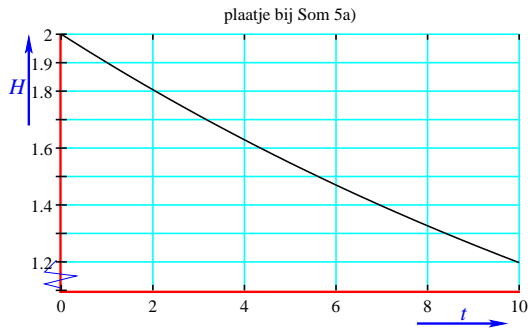
³ Typ & andere fouten & blunders graag Melden!

5c) $\frac{1,55-1,20}{5} = 0,07 \text{ mg/uur}$

5e) Tussen 0 en 5 uur : toename t/m het 5^{de} uur.

Bijelkaar optellen en delen door 5

Tussen 5 en 10 uur: van't zelfde



6a) 50 cm per 0,025 seconden = 2000 cm/sec = 20 m/sec

6b) 20 m/sec = 72000 m/uur = 72 km/uur

7) $s = 5 \cdot t^2$ (t in seconden ; s in meter)

7a) $s = 5t^2 \xrightarrow{t=2} s = 5 \cdot 2^2 = 5 \cdot 4 = 20 \text{ meter}$

7b) $\left. \begin{array}{l} 2 \text{ seconden} \rightarrow 20 \text{ meter} \\ 2,1 \text{ seconden} \rightarrow 22,05 \text{ meter} \end{array} \right\} \Rightarrow \frac{\Delta s}{\Delta t} = \frac{22,05-20}{2,1-2} = \frac{2,05}{0,1} = 20,5 \text{ meter per seconde}$

7c) $\pm 20,5 \text{ m/sec}$

KERN 2 HELLINGEN

8) $y = 2x - 1 \Rightarrow f(x) = 2x - 1$

8b) $\frac{\Delta y}{\Delta x} = \frac{f(5) - f(1)}{5 - 1} = \frac{9 - 1}{4} = 2$

$\frac{\Delta y}{\Delta x} = \frac{f(4) - f(0)}{4 - 0} = \frac{7 - (-1)}{4} = \frac{8}{4} = 2$

$\frac{\Delta y}{\Delta x} = \frac{f(2) - f(2,1)}{2 - 2,1} = \frac{3 - 3,2}{0,1} = \frac{0,2}{0,1} = 2$

8b) 2

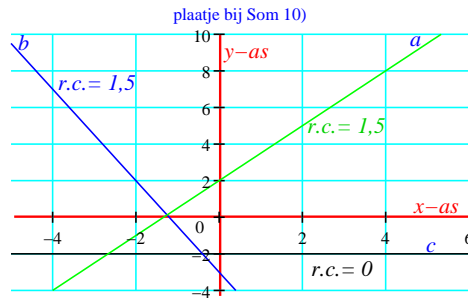
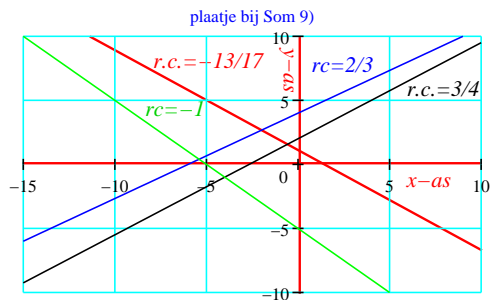
8c) -2

9a) $\frac{\Delta y}{\Delta x} = \frac{6 - 3}{5 - 1} = \frac{3}{4} \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = \frac{3}{4}$

9b) $\frac{\Delta y}{\Delta x} = \frac{8 - 4}{5 - (-1)} = \frac{4}{6} = \frac{2}{3} \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = \frac{2}{3}$

9c) $\frac{\Delta y}{\Delta x} = \frac{-12 - 10}{7 - (-15)} = \frac{-22}{22} = -1 \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = -1$

9e) $\frac{\Delta y}{\Delta x} = \frac{10 - (-3)}{-12 - 5} = \frac{13}{-17} \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = -\frac{13}{17}$



10) Zie plaatje ↗ ↗

11a)

$r.c. = 6 \Rightarrow y = 6x + b \left. \begin{array}{l} (-2; 0) \in \text{lijn} \\ \star \end{array} \right\} \Rightarrow 0 = 6 \cdot (-2) + b \Rightarrow b = 12 \xrightarrow{\text{de Lijn is dus}} y = 6x + 12$

★ $(-2; 0) \in \text{lijn}$ wil zeggen dat punt $(-2; 0)$ een element (\in) is van deze lijn, ofwel dat dit punt op de lijn ligt

11c) $\frac{\Delta y}{\Delta x} = \frac{8 - 0}{0 - (-2)} = \frac{8}{2} = 4 \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = 4$

$r.c. = 4 \Rightarrow y = 4x + b \left. \begin{array}{l} (0; 8) \in \text{lijn} \end{array} \right\} \Rightarrow 8 = 4 \cdot 0 + b \Rightarrow b = 8 \xrightarrow{\text{de Lijn is dus}} y = 4x + 8$

11d) $\frac{\Delta y}{\Delta x} = \frac{0 - 44}{55 - 33} = \frac{-44}{22} = -2 \xrightarrow{\text{Richtingscoefficient=r.c.}} r.c. = -2$

$r.c. = -2 \Rightarrow y = -2x + b \left. \begin{array}{l} (55; 0) \in \text{lijn} \end{array} \right\} \Rightarrow 0 = -2 \cdot 55 + b \Rightarrow 0 = -110 + b \Rightarrow$

$\Rightarrow b = 110 \xrightarrow{\text{de Lijn is dus}} y = -2x + 110$

12b)

$A: (0; 0) \left. \begin{array}{l} B: (20; 10) \end{array} \right\} \Rightarrow \frac{\Delta y}{\Delta x} = \frac{10 - 0}{20 - 0} = \frac{1}{2} \Rightarrow r.c._{AB} = \frac{1}{2}$

12c)

$A: (0; 0) \left. \begin{array}{l} B: (4; 1) \end{array} \right\} \Rightarrow \frac{\Delta y}{\Delta x} = \frac{1 - 0}{4 - 0} = \frac{1}{4} \Rightarrow r.c._{Ac} = \frac{1}{4}$

13a) $\frac{\Delta y}{\Delta x} = \frac{4 - 2}{5 - 1} = \frac{2}{4} = \frac{1}{2} \xrightarrow{\text{Gemiddelde Helling is}} r.c. = \frac{1}{2}$

13b) $\frac{\Delta y}{\Delta x} = \frac{3 - 3}{5 - 1} = \frac{0}{4} = 0 \xrightarrow{\text{Gemiddelde Helling is}} r.c. = 0$

13c) $\frac{\Delta y}{\Delta x} = \frac{3-4}{5-1} = \frac{-1}{4} = -\frac{1}{4} \xrightarrow{\text{Gemiddelde Helling is}} r.c. = -\frac{1}{4}$

14a) $f(x) = 3x - \frac{1}{2}x^2$

x	0	1	2	3	4	5	6	7	8
$f(x)$	0	$2\frac{1}{2}$	4	$6\frac{1}{2}$	4	$2\frac{1}{2}$	0	$-3\frac{1}{2}$	-8

14b)

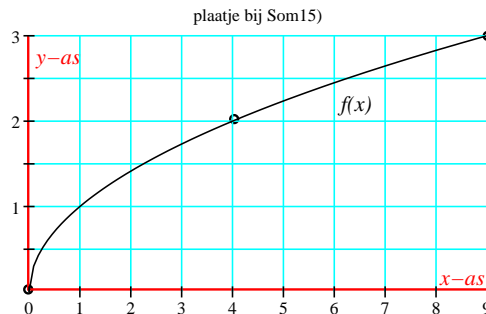
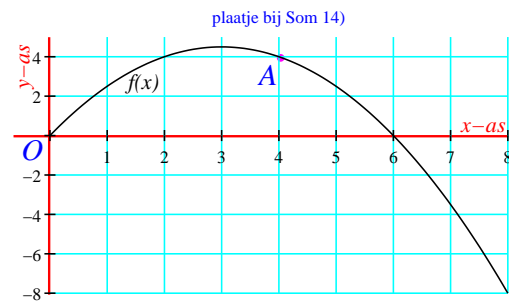
$O: (0;0)$
 $A: (4;4)$ } $\Rightarrow \frac{\Delta y}{\Delta x} = \frac{4-0}{4-0} = 1 \Rightarrow r.c._{OA} = 1$

14c) 1

14d)

$op [2;6] \rightarrow (2;4)$
 $(6;0)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{4-0}{2-6} = \frac{4}{-4} = -1 \Rightarrow r.c. = -1$

$op [1;5] \rightarrow (1;2\frac{1}{2})$
 $(5;2\frac{1}{2})$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{2\frac{1}{2}-2\frac{1}{2}}{5-1} = \frac{0}{4} = 0 \Rightarrow r.c. = 0$



15a) $f(x) = \sqrt{x}$

x	0	1	4	9
$f(x)$	0	1	2	3

15b)

$op [0;9] \rightarrow (0;0)$
 $(9;3)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{3-0}{9-0} = \frac{3}{9} = \frac{1}{3} \Rightarrow r.c. = \frac{1}{3}$

$op [1;4] \rightarrow (1;1)$
 $(4;2)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{2-1}{4-1} = \frac{1}{3} \Rightarrow r.c. = \frac{1}{3}$

$op [4;9] \rightarrow (4;2)$
 $(9;3)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{3-2}{9-4} = \frac{1}{5} \Rightarrow r.c. = \frac{1}{5}$

15c)

$op [0;4] \rightarrow (0;0)$
 $(4;2)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{1}{2}$

$op [0;1] \rightarrow (0;0)$
 $(1;1)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = 1$

$op [0;1/4] \rightarrow (0;0)$
 $(1/4;1/2)$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{1/2}{1/4} = 2$

15d)

$op [0;q] \rightarrow (0;0)$
 $(q;\sqrt{q})$ } $\xrightarrow{\text{gemiddelde Helling}} \frac{\Delta y}{\Delta x} = \frac{\sqrt{q}-0}{q-0} = \frac{\sqrt{q}}{q} = 10 \Rightarrow$

$\Rightarrow \frac{\sqrt{q}}{q} = 10 \Rightarrow \frac{1}{\sqrt{q}} = 10 \Rightarrow \sqrt{q} = \frac{1}{10} \Rightarrow q = \frac{1}{100}$

16a) $f(x) = x^2 [-1;4]$

$\text{Gemiddelde Helling} = \frac{\Delta y}{\Delta x} = \frac{f(4)-f(-1)}{4-(-1)} = \frac{4-4}{4-(-1)} = \frac{0}{5} = 0$

16b) $f(x) = x^2 - 3x [-1;4]$

$\text{Gemiddelde Helling} = \frac{\Delta y}{\Delta x} = \frac{f(4)-f(-1)}{4-(-1)} = \frac{2-7}{4-(-1)} = \frac{-5}{5} = -1$

16c) $f(x) = 6 - x$ $[-1; 4]$

Gemiddelde Helling $= \frac{\Delta y}{\Delta x} = \frac{f(4) - f(-1)}{4 - (-1)} = \frac{2 - 7}{4 - (-1)} = \frac{-5}{5} = -1$

16d) $f(x) = 4$ $[-1; 4]$

Gemiddelde Helling $= \frac{\Delta y}{\Delta x} = \frac{f(4) - f(-1)}{4 - (-1)} = \frac{0 - 0}{4 - (-1)} = \frac{0}{5} = 0$

16e) $f(x) = 5 - x^2$ $[-1; 4]$

Gemiddelde Helling $= \frac{\Delta y}{\Delta x} = \frac{f(4) - f(-1)}{4 - (-1)} = \frac{-11 - 4}{4 - (-1)} = \frac{-15}{5} = -3$

16f) $f(x) = -x^3$ $[-1; 4]$

Gemiddelde Helling $= \frac{\Delta y}{\Delta x} = \frac{f(4) - f(-1)}{4 - (-1)} = \frac{64 - 1}{4 - (-1)} = \frac{-65}{5} = -13$

17a)

$op [0; 60] \longrightarrow \left. \begin{array}{l} (0; 0) \\ (60; 80) \end{array} \right\} \xrightarrow{\text{gemiddelde Helling}} \frac{\Delta s}{\Delta t} = \frac{80 - 0}{60 - 0} = \frac{8}{6} = 1\frac{1}{3}$

17b) $80 \text{ km/uur} = 1\frac{1}{3} \text{ km/minuut}$

17c)

$\left. \begin{array}{l} (45; 60) \\ (75; 93) \end{array} \right\} \xrightarrow{\text{gemiddelde Snelheid}} \frac{93 - 60}{75 - 45} = \frac{33}{30} = 1,1 \text{ km/min}$

17d) r.c. Raaklijn in punt $(60; 80)$ is $\pm 1,1 \longrightarrow 1,1 \text{ km/min} \Rightarrow 1,1 \cdot 60 = 66 \text{ km/uur}$

18a)

Paula: constant tempo

Els: eerst snel dan langzaam en tenslotte nog even heel snel

18b) Voor beide $4 \text{ km}/20 \text{ min} = 12 \text{ km/uur}$

18c) In de $7\frac{1}{2}^{\text{de}}$ minuut (eigenlijk er net voor)
en in de 18^{de} minuut (ongeveer..)

KERN 3

HELLING IN EEN PUNT

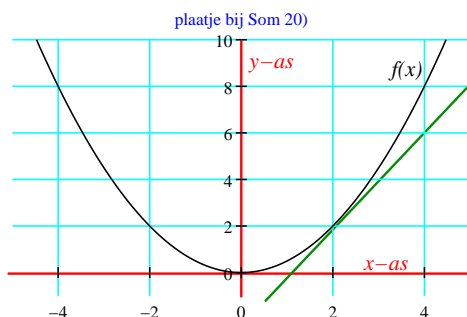
19a) Bij 3 en 4

19b) Bij 1, 2, 5 en 6

19c) Geen

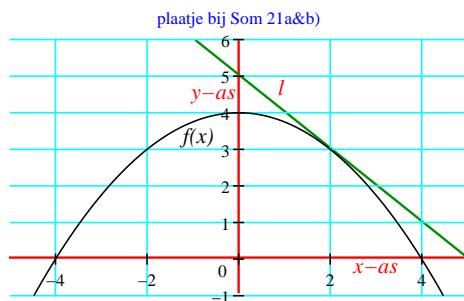
20) $y = \frac{1}{2}x^2$

x	-4	-2	0	2	4
y	9	2	0	2	8



21a&b) $y = 4 - \frac{1}{4}x^2$

x	-2	-1	0	1	2	3
y	3	$3\frac{3}{4}$	4	$3\frac{3}{4}$	3	$1\frac{3}{4}$



21c) -1

21d) (-2;3)

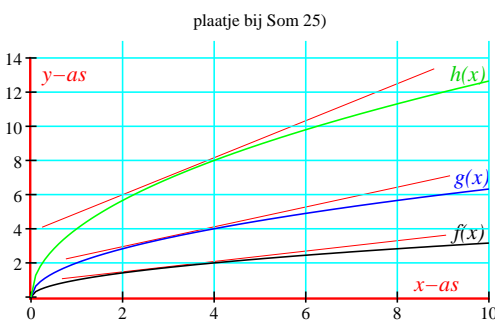
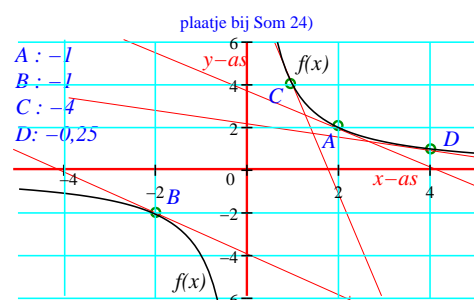
22) r.c. = $\frac{1}{2}$

23a) A: 1 B: 0 C: $-\frac{1}{2}$ D: 0 E: 1

23b) (7;6) en (14;4)

24c) $y = \frac{4}{x}$ [-5;5]

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
y	$-\frac{4}{5}$	-1	$-\frac{4}{3}$	-2	-4	f	4	2	$1\frac{1}{3}$	1	$\frac{4}{5}$
r.c				B: -1			C: -4	A: -1		D: $-\frac{1}{4}$	



25a) $f(x) = \sqrt{x}$ $g(x) = 2\sqrt{x}$ $h(x) = 4\sqrt{x}$

x	0	1	4	9
f(x)	0	1	2	3
g(x)	0	2	4	6
h(x)	0	4	8	12

25b)

[1;9] gemiddelde helling f: $\frac{\Delta y}{\Delta x} = \frac{f(9)-f(1)}{9-1} = \frac{3-1}{9-1} = \frac{2}{8} = \frac{1}{4}$

[1;9] gemiddelde helling g: $\frac{\Delta y}{\Delta x} = \frac{f(9)-f(1)}{9-1} = \frac{6-2}{9-1} = \frac{4}{8} = \frac{1}{2}$

25c) $f : \frac{1}{4} \quad g : \frac{1}{2}$

25d) $h : 4 \cdot \frac{1}{4} = 1$

26a) Groeisnelheid constant va 1,5 tot 2,5 jaar: 2 meter/jaar

26b) $\pm 0,6$ tot $0,7$ meter/jaar

$\frac{1}{12} \cdot 0,6 = 0,05$ meter = 5 centimeter

27a) $S = 1,5t^2$

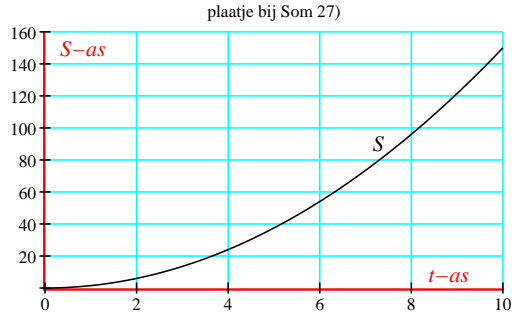
t	0	1	2	4	6	8	10
S	0	1,5	6	24	54	96	150

27b&c)

$t = 0 \rightarrow 0 \text{ m/s} = 0 \text{ km/uur}$

$t = 5 \rightarrow 15 \text{ m/s} = 54 \text{ km/uur}$

$t = 10 \rightarrow 30 \text{ m/s} = 108 \text{ km/uur}$



28) $h = -x^2 + 10x$

28a) 10 en -10

28b) Snelheid van de vuurpijl

28c) (5;25)

29) $f(x) = x^2 + 1$

29a) 2

29b)

$[1; 1] : \frac{\Delta y}{\Delta x} = \frac{f(2)-f(1)}{2-1} = \frac{5-2}{1} = 3$

$[1; 1\frac{1}{2}] : \frac{\Delta y}{\Delta x} = \frac{f(1\frac{1}{2})-f(1)}{1\frac{1}{2}-1} = \frac{3,25-2}{\frac{1}{2}} = 2,5$

$[1; 1, 1] : \frac{\Delta y}{\Delta x} = \frac{f(1,1)-f(1)}{1,1-1} = \frac{2,21-2}{0,1} = 2,1$

29c) 2

30b)

$[4; 6] : \frac{\Delta y}{\Delta x} = \frac{f(6)-f(4)}{6-4} = \frac{\sqrt{6}-\sqrt{4}}{2} \approx 0,225$

$[4; 5] : \frac{\Delta y}{\Delta x} = \frac{f(5)-f(4)}{5-4} = \frac{\sqrt{5}-\sqrt{4}}{1} \approx 0,236$

$[4; 4, 1] : \frac{\Delta y}{\Delta x} = \frac{f(4,1)-f(4)}{4,1-4} = \frac{\sqrt{4,1}-\sqrt{4}}{0,1} \approx 0,248$

30c) $[4; 4, 001] : \frac{\Delta y}{\Delta x} = \frac{f(4,001)-f(4)}{4,001-4} = \frac{\sqrt{4,1}-\sqrt{4}}{0,001} \approx 0,25$

31a) $f(x) = x^2 + x$ in (3;12)

$[3; 4] : \frac{\Delta y}{\Delta x} = \frac{f(4)-f(3)}{4-3} = \frac{10-12}{1} = 8$

$f(x) = x^2 + x \rightarrow [3; 3\frac{1}{2}] : \frac{\Delta y}{\Delta x} = \frac{f(3\frac{1}{2})-f(3)}{3\frac{1}{2}-3} = \frac{15,25-12}{\frac{1}{2}} = 6,5$

$[3; 3, 001] : \frac{\Delta y}{\Delta x} = \frac{f(3,001)-f(3)}{3,001-3} = \frac{12,006001-12}{0,001} = 6,001$

} De Helling in (3;12) is $\rightarrow 6$

31b) $f(t) = 2^t$ in (2;4)

$[2; 3] : \frac{\Delta y}{\Delta t} = \frac{f(3)-f(2)}{3-2} = \frac{8-4}{1} = 4$

$f(t) = 2^t \rightarrow [2; 2\frac{1}{2}] : \frac{\Delta y}{\Delta t} = \frac{f(2\frac{1}{2})-f(2)}{2\frac{1}{2}-2} \approx \frac{5,657-4}{\frac{1}{2}} \approx 3,314$

$[2; 2, 001] : \frac{\Delta y}{\Delta t} = \frac{f(2,001)-f(2)}{2,001-2} \approx \frac{4,0028-4}{0,001} \approx 2,77$

} Helling in (2;4) is $\approx 2,8$

31c) $g(t) = \sin(t)$ in (0;0)

$[0; 1] : \frac{\Delta y}{\Delta t} = \frac{\sin(1)-\sin(0)}{1-0} \approx 0,841$

$f(t) = \sin(t) \rightarrow [0; 0,5] : \frac{\Delta y}{\Delta t} = \frac{\sin(0,5)-\sin(0)}{0,5-0} \approx 0,959$

$[0; 0, 001] : \frac{\Delta y}{\Delta t} = \frac{\sin(0,001)-\sin(0)}{0,001-0} \approx 1$

} Helling in (0;0) is ≈ 1

31d) -2 \leftarrow RechteLijn de helling is Overal hetzelfde

31e) $h(t) = 1 - t^2$ in $(4; -15)$

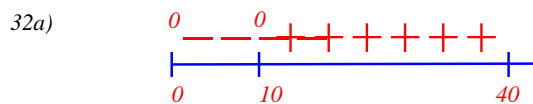
$$\begin{array}{l}
 [4; 4, 1] : \frac{\Delta y}{\Delta t} = \frac{f(4,1) - f(4)}{4,1 - 4} = \frac{-15,81 - (-15)}{0,1} = -8,1 \\
 h(t) = 1 - t^2 \rightarrow [4; 4, 01] : \frac{\Delta y}{\Delta t} = \frac{f(4,01) - f(4)}{4,01 - 4} = \frac{-15,0801 - (-15)}{0,01} = 8,01 \\
 [4; 4, 001] : \frac{\Delta y}{\Delta t} = \frac{f(4,001) - f(4)}{4,001 - 4} = \frac{-15,008001 + 15}{0,001} = -8,001
 \end{array}
 \left. \vphantom{\begin{array}{l} [4; 4, 1] \\ [4; 4, 01] \\ [4; 4, 001] \end{array}} \right\} \xrightarrow{\text{Hellingin}(4; -15)} -8$$

31f) $k(t) = 20 - 5\sqrt{t}$ in $(4, 10)$

$$\begin{array}{l}
 [4; 4, 1] : \frac{\Delta y}{\Delta t} = \frac{f(4,1) - f(4)}{4,1 - 4} \simeq \frac{9,876 - 10}{0,1} \simeq -1,242 \\
 k(t) = 20 - 5\sqrt{t} \rightarrow [4; 4, 001] : \frac{\Delta y}{\Delta t} = \frac{f(4,001) - f(4)}{4,001 - 4} \simeq \frac{9,9988 - 10}{0,001} \simeq -1,2499
 \end{array}
 \left. \vphantom{\begin{array}{l} [4; 4, 1] \\ [4; 4, 001] \end{array}} \right\} \xrightarrow{\text{Hellingin}(4; 10)} -1,25$$

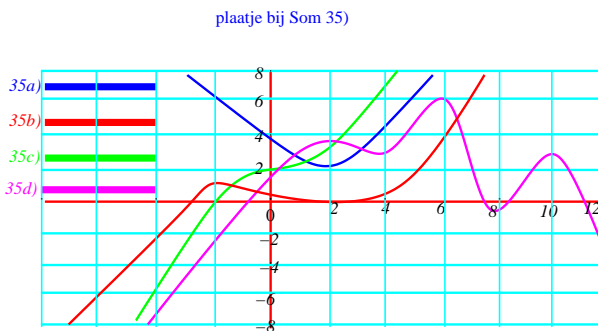
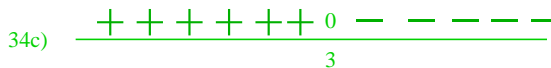
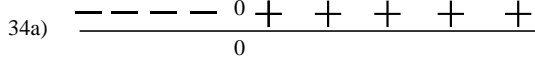
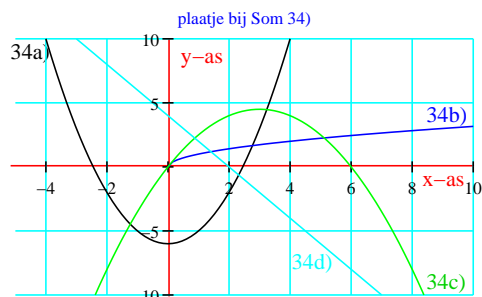
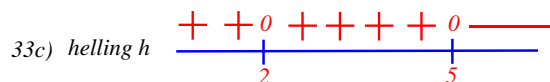
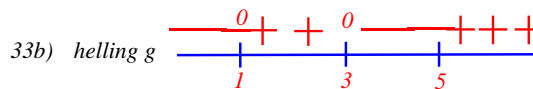
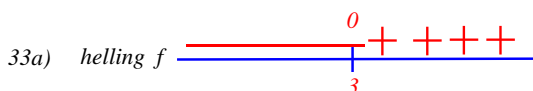
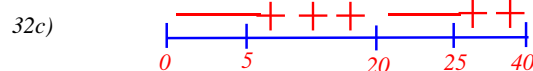
KERN 4

DE HELLINGSFUNCTIE



32b) dalen \longrightarrow [0;5]

dalen \longrightarrow [20;24]



36a)

36b) 0

36c)

(1; 1) [1; 1,001]: $\frac{\Delta y}{\Delta x} = \frac{(1,001)^2 - 1^2}{1,001 - 1} = 2,001 \leftarrow \text{HELLING 2}$

(2; 4) [2; 2,001]: $\frac{\Delta y}{\Delta x} = \frac{(2,001)^2 - 2^2}{2,001 - 2} = 4,001 \leftarrow \text{HELLING 4}$

(3; 9) [3; 3,001]: $\frac{\Delta y}{\Delta x} = \frac{(3,001)^2 - 3^2}{3,001 - 3} = 6,001 \leftarrow \text{HELLING 6}$

(4; 16) [4; 4,001]: $\frac{\Delta y}{\Delta x} = \frac{(4,001)^2 - 4^2}{4,001 - 4} = 8,001 \leftarrow \text{HELLING 8}$

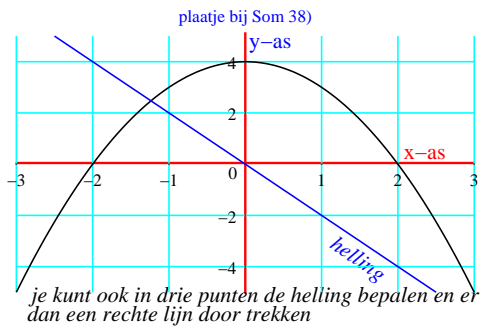
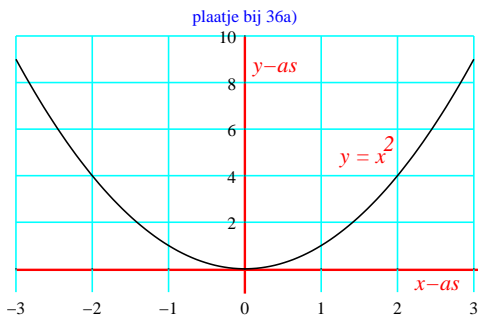
36d)

(-4; 16) [-3,999; -4]: $\frac{\Delta y}{\Delta x} = \frac{(-3,999)^2 - (-4)^2}{-3,999 - (-4)} \simeq -7,999 \leftarrow \text{HELLING -8}$

36e)

x	-4	-3	-2	-1	0	1	2	3	4
f(x)	16	9	4	1	0	1	4	9	16
Helling	-8	-6	-4	-2	0	2	4	6	8

36f) helling in punt (10;100) is 20



37a) $y = x^2$

helling (6) = $2 \cdot 6 = 12$

37b) *helling* (-8) = $2 \cdot -8 = -16$

37c) *helling* (x) = $2 \cdot x = 5 \Rightarrow x = 2\frac{1}{2} \xrightarrow{\text{Het Punt}} (2\frac{1}{2}; (2\frac{1}{2})^2)$ dus $(2\frac{1}{2}; 6\frac{1}{4})$

37d) $y = x^2 + 4$ heeft dezelfde vorm als $y = x^2$, maar ligt 4 eenheden hoger.

Dus de *helling* (6) = $2 \cdot 6 = 12$

38)

A en D

C en E

functie **C** is overal stijgend \Rightarrow *helling* > 0

Voor $x < 0$ is de functie **C** eerst afnemend stijgend, dan toenemend stijgend.

38b)

39a) $(\frac{1}{2}\pi; 1)$ $(1\frac{1}{2}\pi; -1)$

39b)

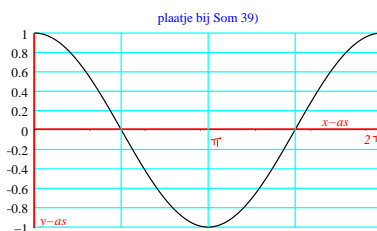
Positief: $[0; \frac{1}{2}\pi]$ en $[1\frac{1}{2}\pi; 2\pi]$

Negatief: $[\frac{1}{2}\pi; 1\frac{1}{2}\pi]$

39c) Zie som 31c)

39d)

39e) $f'(x) = \cos x$



40a) $f(x) = 2^x$

$[4; 4,001] : \frac{\Delta y}{\Delta x} = \frac{2^{4,001} - 2^4}{4,001 - 4} \approx 11,094$

40b)

x	f(x) = 2 ^x	Helling
0	1	0,69
1	2	1,39
2	4	2,77
3	8	5,55
4	16	11,09
5	32	22,18

$[5; 5,001] : \frac{\Delta y}{\Delta x} = \frac{2^{5,001} - 2^5}{5,001 - 5} \approx 22,188$

40c)

$$\left. \begin{array}{l} \frac{1,39}{0,69} \approx 2 \\ \frac{2,77}{1,39} \approx 2 \\ \frac{5,55}{2,77} \approx 2 \\ \frac{11,09}{5,55} \approx 2 \end{array} \right\} \xrightarrow{DUS} 2$$

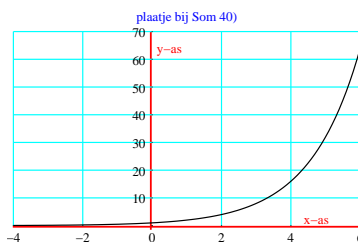
40d) *helling* (x) = $0,69 - 2^x$

$[0; 0,001] : \frac{\Delta y}{\Delta x} = \frac{2^{0,001} - 2^0}{0,001 - 0} \approx 0,693$

$[1; 1,001] : \frac{\Delta y}{\Delta x} = \frac{2^{1,001} - 2^1}{1,001 - 1} \approx 1,387$

$[2; 2,001] : \frac{\Delta y}{\Delta x} = \frac{2^{2,001} - 2^2}{2,001 - 2} \approx 2,774$

$[3; 3,001] : \frac{\Delta y}{\Delta x} = \frac{2^{3,001} - 2^3}{3,001 - 3} \approx 5,547$



GRAFISCHE REKENMACHINE

G1) $y_1 = 100 - 1,5^x$

G1a) $y_1(5) - y_1(2) \simeq -5,344$

G1b) $\frac{\Delta y}{\Delta x} \simeq \frac{-5,344}{3} \simeq -1,781$

G1c) $y_1(10) - y_1(50) \simeq -50,071 \quad \frac{\Delta y}{\Delta x} \simeq \frac{-50,071}{5} \simeq -10,01$

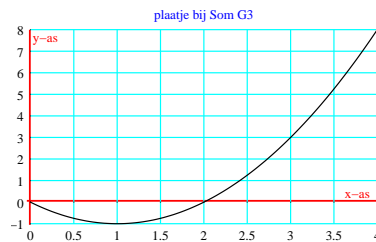
G2a) $f(x) = \frac{100x}{10+2^x}$

G2b) Maximum 16,69

G2c) $\frac{\Delta f}{\Delta x} = \frac{f(6)-f(0)}{6-0} \simeq \frac{8,108-15,385}{2} \simeq -3,64$

G2d) $[1; p] : \frac{\Delta f}{\Delta x} = \frac{f(9)-f(1)}{p-1} = 0 \Rightarrow f(p) = f(1) = \frac{100}{2} = 50 \Rightarrow f(p) = 8\frac{1}{3} \Rightarrow p \simeq 5,94$

G3a) $f(x) = x^2 - 2x$



G3b)

x		0		0,5		1		1,5		2		2,5		3		3,5		4
$\frac{\Delta y}{\Delta x}$				-1,5↓		-0,5		0,5↓		1,5		2,5↓		3,5		4,5		5,5
				$\frac{f(0,5)-f(0)}{0,5-0}$				$\frac{f(1,5)-f(1)}{1,5-1}$				$\frac{f(2,5)-f(2)}{2,5-2}$						

G3c)

x		1,95		1,96		1,97		1,98		1,99		2,00		2,01		2,02		2,03		2,04		2,05
$\frac{\Delta y}{\Delta x}$				1,91↓		1,93		1,95↓		1,97		1,99↓		2,01		2,03		2,05		2,07		2,09
				$\frac{f(1,96)-f(1,95)}{1,96-1,95}$				$\frac{f(1,98)-f(1,97)}{1,98-1,97}$				$\frac{f(2,00)-f(1,99)}{2,00-1,99}$										

G3d) helling (2) = 2