Graad 11 – Boek B
(CAPS Uitgawe)

INHOUD:

Hierdie boek is opgestel en verwerk deur E.J. Du Toit in 2008.
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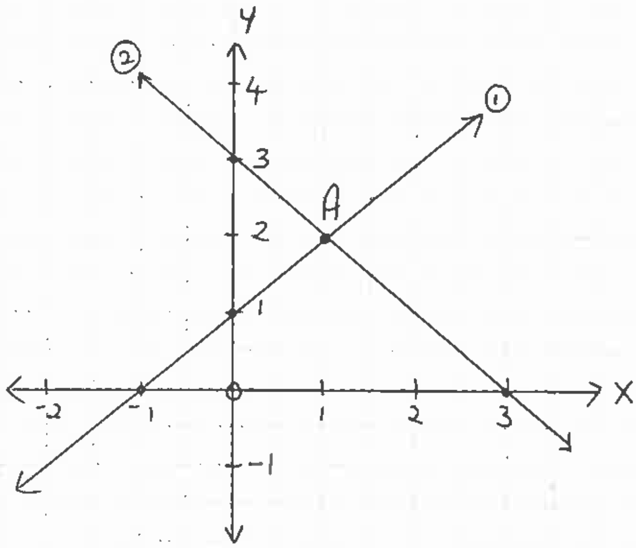
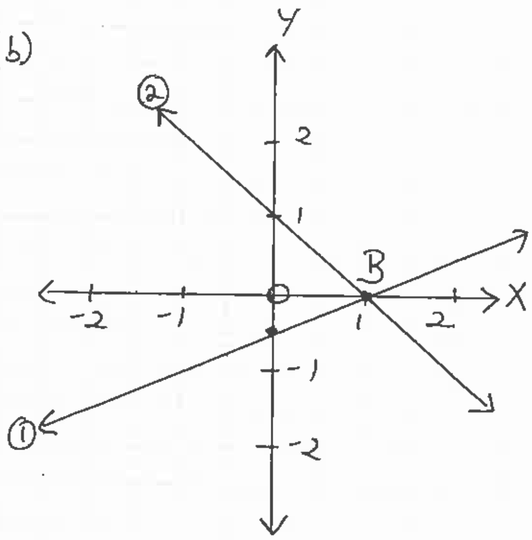
(1)(a)



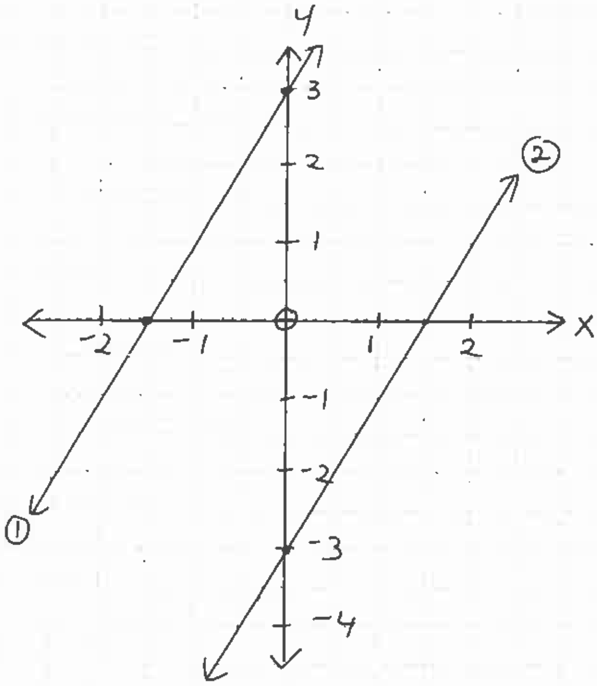
$A(1;2)$

(b)



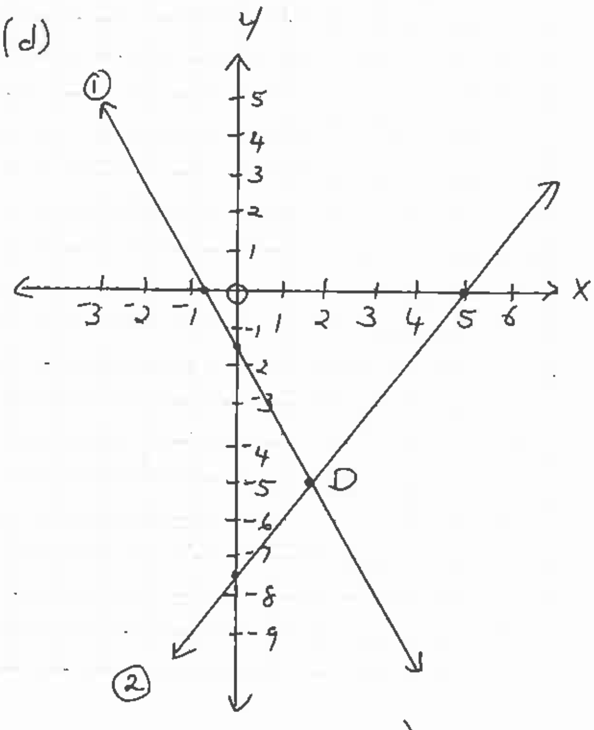
$B(1;0)$

(c)



Geen snypunt.
Lyne ewewydig!

(d)



$D(\frac{3}{2};-5)$

Hoofstuk B1

Funksies

B1.1 Lineêre funksie:

Hersiening!

Standaardvorm: $y = mx + c$ met $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ as die gradiënt en c as die y-afsnit.

Oefening 1: Datum:______________

(1) Skets die volgende pare reguitlyne telkens op dieselfde assestelsel en bepaal die gemeenskaplike snypunt vir elk:

(a) $x - y + 1 = 0$ en $x + y = 3$

$x - y + 1 = 0$ ---①
x-afs: $(-1;0)$
y-afs: $(0;1)$
$x + y = 3$ ---②
x-afs: $(3;0)$
y-afs: $(0;3)$

(b) $2y + 1 = x$ en $x + y = 1$

$2y + 1 = x$ ---①
x-afs: $(1;0)$
y-afs: $(0;\frac{-1}{2})$
$x + y = 1$ ---②
x-afs: $(1;0)$
y-afs: $(0;1)$

(c) $2x + 3 = y$ en $2y - 4x + 6 = 0$

$2x + 3 = y$ ---①
x-afs: $(-\frac{3}{2};0)$
y-afs: $(0;3)$
$2y - 4x + 6 = 0$ ---②
x-afs: $(\frac{3}{2};0)$
y-afs: $(0;-3)$

(d) $4x + 2y = -3$ en $2y + 15 = 3x$

$4x + 2y = -3$ ---①
x-afs: $(-\frac{3}{4};0)$
y-afs: $(0;-\frac{3}{2})$
$2y + 15 = 3x$ ---②
x-afs: $(5;0)$
y-afs: $(0;\frac{-15}{2})$

(2) Bepaal die vergelyking van die reguitlyn:

(a) deur die punte $(1;3)$ en $(2;-1)$
$x_1\ y_1 \quad x_2\ y_2$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{-1-3}{2-1} = \dfrac{-4}{1} = -4$
$y - y_1 = m(x - x_1)$
$y - 3 = -4(x - 1)$
$y - 3 = -4x + 4$
$y = -4x + 7$

(b) deur die punt $(4;0)$ en ewewydig aan $3y + 6x - 2 = 0$

$3y = -6x + 2$
$y = -2x + \frac{2}{3}$
$\therefore m_1 = -2 = m_2$ (// lyne)
$\therefore y - y_1 = m(x - x_1)$
$y - 0 = -2(x - 4)$
$y = -2x + 8$

(c) deur die punte (3 ; -7) en (3 ; 4)

$x = 3$ in albei punte

$\therefore \quad x = 3$

(d) deur die punt (0 ; 2) met 'n inklinasie van 135°

$m = \tan \theta$

$m = \tan 135°$

$m = -1$ deur $(0 ; 2)$ — x, c

$\therefore \quad y = mx + c$

$y = -1x + 2$

(3) Die punte A(3 ; 5), B(0 ; 4) en C(-1 ; *m*) is kollineêr. Bepaal die waarde van *m*.

$m_{AB} = \frac{4-5}{0-3} = \frac{-1}{-3} = \frac{1}{3}$

$m_{BC} = \frac{m-4}{-1-0} = \frac{m-4}{-1}$

maar vir kollineêr is $m_{AB} = m_{BC}$

$\therefore \quad \frac{1}{3} = \frac{m-4}{-1}$

$-1 = 3(m-4)$

$-1 = 3m - 12$

$11 = 3m \quad \therefore \quad m = \frac{11}{3}$

(4) $3x - 2y = 3$ en $px + 1 = 2y$ is loodreg op mekaar. Bereken p.

$3x - 2y = 3$ en $px + 1 = 2y$

$3x - 3 = 2y \qquad y = \frac{p}{2}x + \frac{1}{2}$

$\frac{3}{2}x - \frac{3}{2} = y$

As lyne $\perp$ is: $m_1 \times m_2 = -1$

$\therefore \quad \frac{3}{2} \times \frac{p}{2} = -1$

$\frac{3p}{4} = -1$

$3p = -4$

$p = \frac{-4}{3}$

B1.2 Kwadratiese funksie (parabool):

B1.2.1 Skets van die parabool:

B1.2.1.1 Standaardvorm 1:

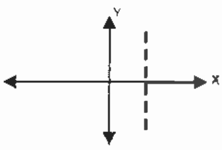
$y = ax^2 + bx + c$

Invloed van a: [Vorm!]

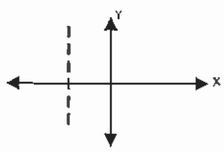
As $a > 0$:  en as $a < 0$: 

Invloed van b: [Simmetrie-as!]

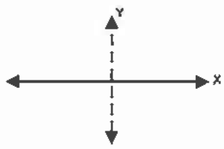
As simm-as $(x) = \frac{-b}{2a} > 0$ dan is:



As simm-as $(x) = \frac{-b}{2a} < 0$ dan is:



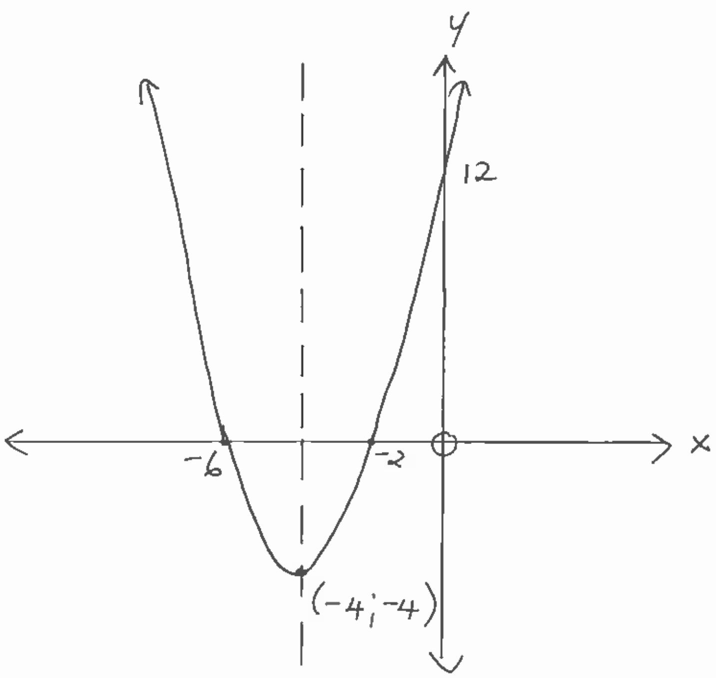
As simm-as $(x) = \frac{-b}{2a} = 0$ dan is:



Invloed van c: [*y*-afsnit!]

c verteenwoordig, net soos by die reguitlyn, die *y*-afsnit van die parabool.

(1) (a)



Vb. 1 Skets die volgende: $2y = -2x^2 + 4x + 16$

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Stap 1 *[Skryf vergelyking in standaardvorm]:* $y = -x^2 + 2x + 8$

Stap 2 *[Interpreteer die vorm]:* $a < 0 \quad \therefore \frown$

Stap 3 *[Bepaal die y-afsnit]:* $c = 8$ *of stel* $x = 0$ $\therefore$ *y-afsnit:* $(0 ; 8)$

Stap 4 *[Bepaal die x-afsnit(te)]: Daar kan twee, een of geen x-afsnit(te) wees.*

Stel $y = 0 \rightarrow \quad 0 = -x^2 + 2x + 8$

$0 = x^2 - 2x - 8$

$0 = (x - 4)(x + 2)$

$\therefore \; x = 4$ *of* $x = -2$

$\therefore$ *x-afsnitte:* $(4 ; 0)$ *en* $(-2 ; 0)$

NS: Indien daar nie faktore is nie, maak gebruik van die formule!

Stap 5 *[Bepaal die vergelyking van die simmetrie-as]:* *Formule* $\rightarrow \; x = \frac{-b}{2a}$

Uit standaardvorm is $a = -1$ *en* $b = 2 \rightarrow$ $x = \frac{-(2)}{2(-1)}$

$x = \frac{-2}{-2} = 1$

óf die simm-as is presies tussen die twee x-afsnitte: $\therefore$ *simm-as* $= \frac{4 + (-2)}{2} = \frac{2}{2} = 1$

Stap 6 *[Bepaal die draaipunt se koördinate]:*

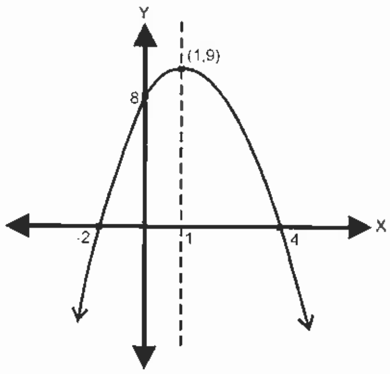
Vervang $x = 1$ *(simm-as) in vgl van stap 1*

$\therefore \; y = -x^2 + 2x + 8$

$\therefore \; y = -(1)^2 + 2(1) + 8$

$\therefore \; y = -1 + 2 + 8 = 9$ $\therefore$ *DP* $= (1 ; 9)$

Stap 7 *[Skets die funksie se kromme]:*
Toon x-en y-afsnitte en draaipunt duidelik aan.



Afleidings:

Maks waarde van 9
Def vers: $x \in R$
Waarde vers: $y \leq 9$

Oefening 2: Datum:____________

(1) Skets die volgende funksies op verskillende assestelsels: (Skets links!)

(a) $y = x^2 + 8x + 12$ Vorm: $a > 0$ $\smile$

y-afs: $(0;12)$

x-afs:

$0 = x^2 + 8x + 12$

$0 = (x+6)(x+2)$

$\therefore x = -6$ of $x = -2$

$(-6;0)$ $(-2;0)$

simm-as: $x = \frac{-6+(-2)}{2}$

$x = -4$

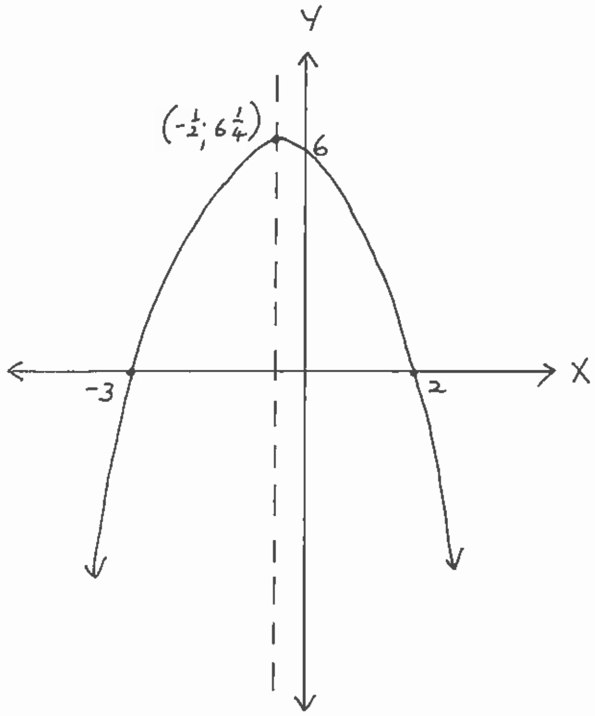
DP: $y = (-4)^2 + 8(-4) + 12$

$= 16 - 32 + 12$

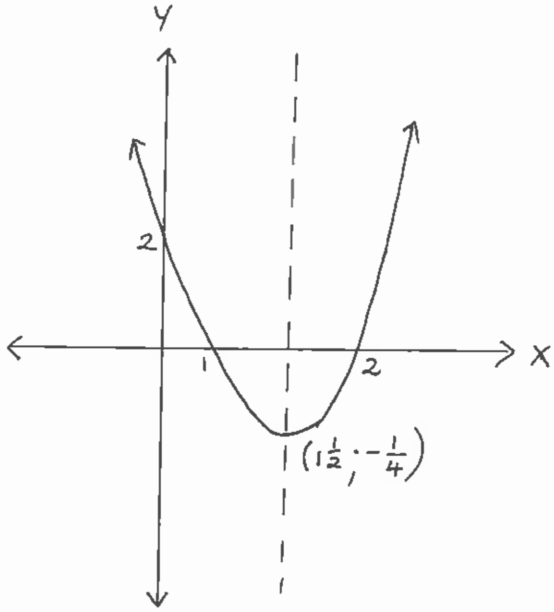
$y = -4$

$\therefore$ DP $= (-4;-4)$

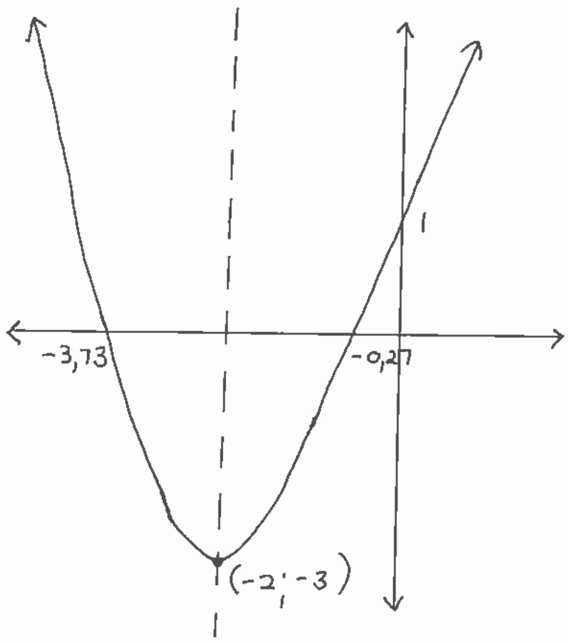
(b)



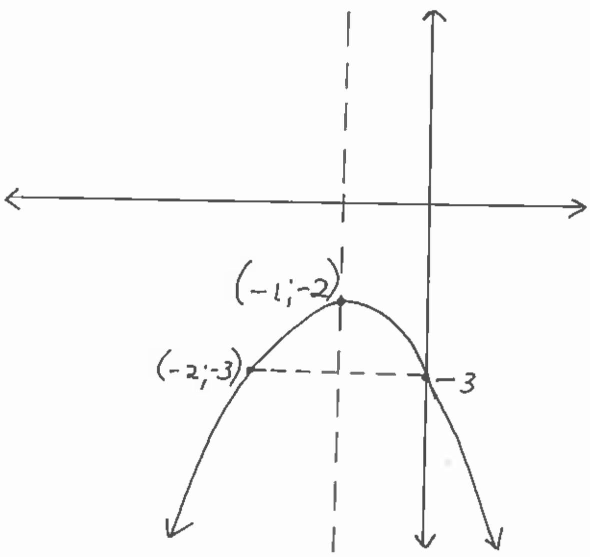
(c)



(d)



(e)



(b) $y = -x^2 - x + 6$

Vorm: $a<0$ ∩

y-afs: $(0;6)$

x-afs: $0 = -x^2 - x + 6$

$0 = x^2 + x - 6$

$0 = (x+3)(x-2)$

$x = -3$ of $x = 2$

$(-3;0)$ $(2;0)$

simm-as: $x = \frac{-b}{2a} = \frac{-(-1)}{2(-1)}$

$\therefore x = -\frac{1}{2}$

DP: $y = -(-\frac{1}{2})^2 - (-\frac{1}{2}) + 6$

$y = -(\frac{1}{4}) + \frac{1}{2} + 6$

$y = -\frac{1}{4} + \frac{2}{4} + \frac{24}{4}$

$y = \frac{25}{4}$

$\therefore DP(-\frac{1}{2}; \frac{25}{4})$

(c) $2y = 2x^2 - 6x + 4$

$y = x^2 - 3x + 2$

Vorm: $a>0$ ∪

y-afs: $(0;2)$

x-afs: $0 = x^2 - 3x + 2$

$0 = (x-2)(x-1)$

$x = 2$ of $x = 1$

$(2;0)$ $(1;0)$

simm-as: $x = \frac{2+1}{2}$

$\therefore x = \frac{3}{2} = 1\frac{1}{2}$

DP: $y = (\frac{3}{2})^2 - 3(\frac{3}{2}) + 2$

$y = \frac{9}{4} - \frac{9}{2} + 2$

$y = \frac{9}{4} - \frac{18}{4} + \frac{8}{4}$

$y = -\frac{1}{4}$

$\therefore DP(\frac{3}{2}; -\frac{1}{4})$

(d) $y = x^2 + 4x + 1$

Vorm: $a>0$ ∪

y-afs: $(0;1)$

x-afs: $0 = x^2 + 4x + 1$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-4 \pm \sqrt{4^2 - 4(1)(1)}}{2(1)}$

$x = \frac{-4 \pm \sqrt{12}}{2}$

$x = -0{,}27$ of $x = -3{,}73$

Simm-as: $x = \frac{-b}{2a}$

$x = \frac{-4}{2(1)}$

$x = -2$

DP: $y = (-2)^2 + 4(-2) + 1$

$= 4 - 8 + 1$

$y = -3$

$\therefore DP(-2; -3)$

(e) $y = -x^2 - 2x - 3$

Vorm: $a<0$ ∩

y-afs: $(0;-3)$

x-afs: $0 = -x^2 - 2x - 3$

$0 = x^2 + 2x + 3$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-2 \pm \sqrt{(2)^2 - 4(1)(3)}}{2(1)}$

$x = \frac{-2 \pm \sqrt{-8}}{2}$

$\therefore$ Geen $\mathbb{R}$ wortels

$\Rightarrow$ geen x-afsnitte

simm-as: $x = \frac{-(-2)}{2(-1)} = -1$

DP: $y = -(-1)^2 - 2(-1) - 3$

$= -(1) + 2 - 3$

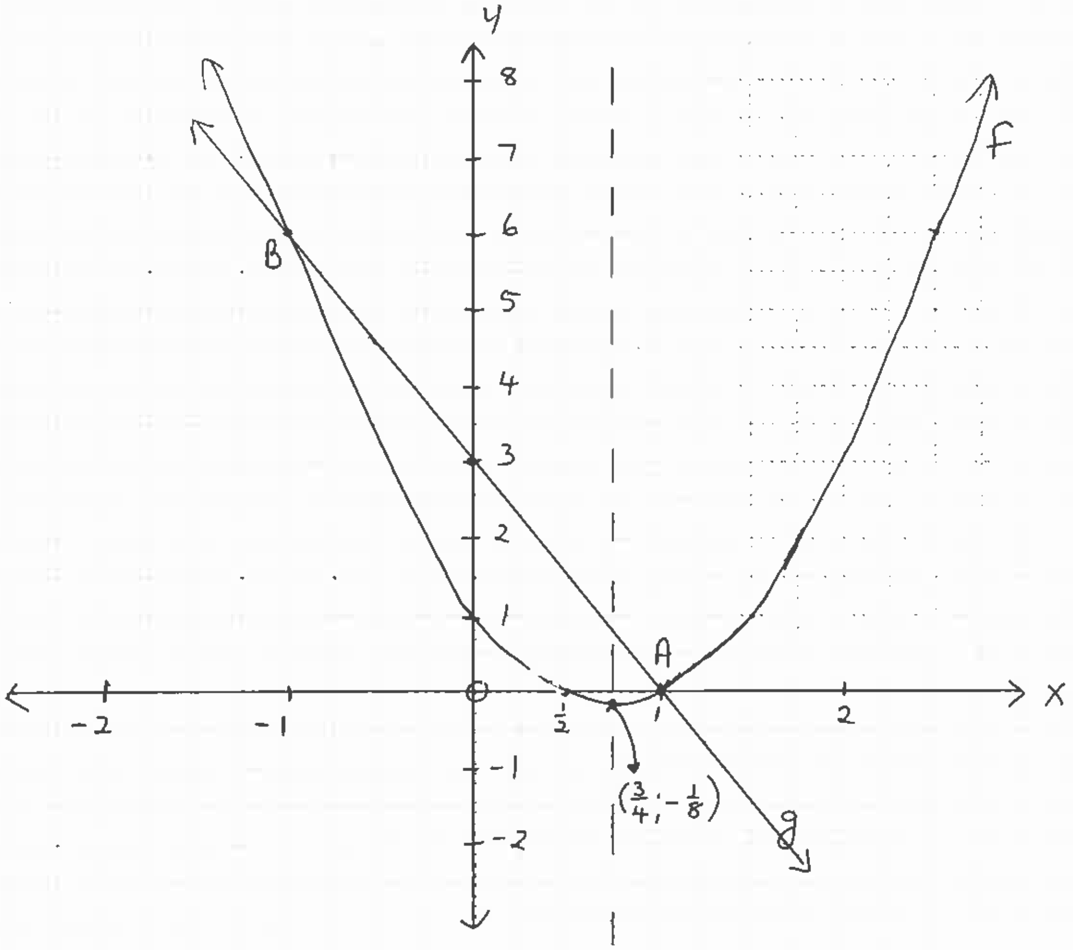
$y = -1 + 2 - 3$

$y = -2$

$\therefore DP(-1; -2)$

Kontrole punt $P(-2; -3)$

(2)(a)


y
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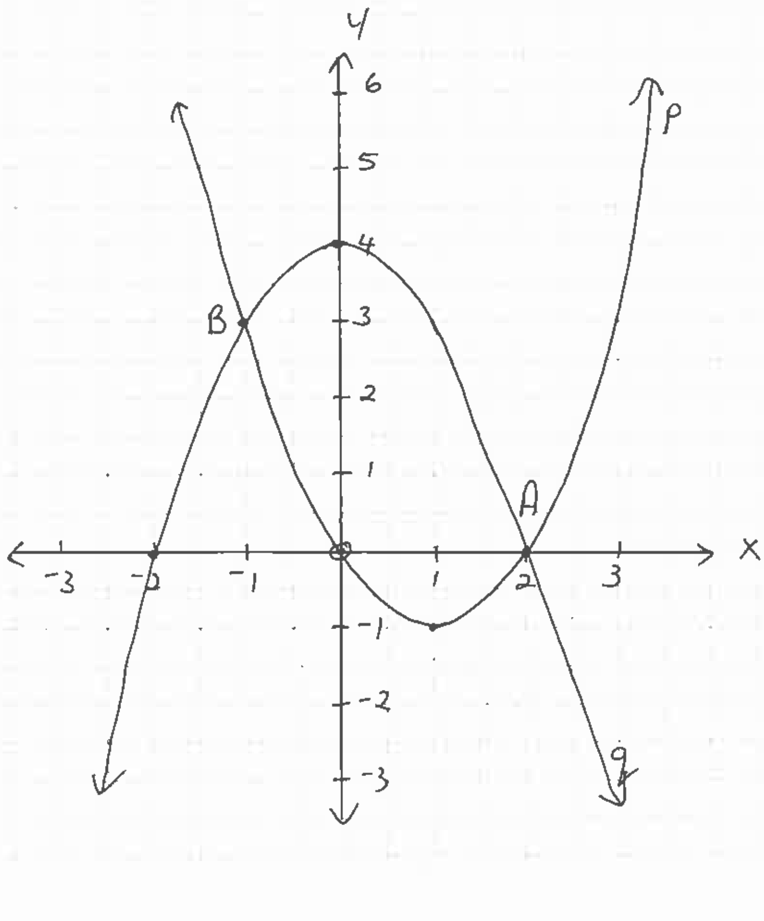
5
4
3
2
1
-1
-2
x
-2
-1
$\frac{1}{2}$
1
2
B
A
f
g
$(\frac{3}{4}; -\frac{1}{8})$

(3)(a)


y
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B
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p
g

(2) Beskou: $f(x) = 2x^2 - 3x + 1$

(a) Skets f. Toon alle berekeninge.

$f(x) = y = 2x^2 - 3x + 1$ Vorm: $a > 0$ ∪

y-afs: $(0;1)$

x-afs: $0 = 2x^2 - 3x + 1$

$0 = (2x-1)(x-1)$

$2x - 1 = 0$ of $x = 1$

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

simm-as: $x = \frac{-b}{2a}$

$x = \frac{-(-3)}{2(2)} = \frac{3}{4}$

DP: $y = 2(\frac{3}{4})^2 - 3(\frac{3}{4}) + 1$

$= 2 \times \frac{9}{16} - \frac{9}{4} + 1$

$y = \frac{9}{8} - \frac{18}{8} + \frac{8}{8}$

$y = -\frac{1}{8}$ $\therefore DP(\frac{3}{4}; -\frac{1}{8})$

(b) Skets op dieselfde assestelsel as in (a): $g: x \to -3x + 3$. Toon alle berekeninge.

$\therefore y = -3x + 3$

x-afs:

$0 = -3x + 3$

$3x = 3$ $\therefore x = 1$ $\therefore (1;0)$

y-afs: $(0;3)$

(c) Bepaal die volgende:
(i) g se definisieversameling.
(ii) f se waardeversameling.
(iii) Vergelyking van f se simmetrie-as.
(iv) Die koördinate waar $f \cap g$.

(i) $x \in \mathbb{R}$

(ii) $y \geq -\frac{1}{8}$

(iii) $x = \frac{3}{4}$

(iv) By $A(1;0)$ en $B(-1;6)$

(3) (a) Skets die volgende op dieselfde assestelsel: $p(x) = x^2 - 2x$ en $q(x) = 4 - x^2$

$p(x) = y = x^2 - 2x$ ∪

y-afs: $(0;0)$

x-afs: $0 = x^2 - 2x$

$0 = x(x-2)$

$x = 0$ of $x = 2$

simm-as: $x = \frac{0+2}{2} = 1$

DP: $y = (1)^2 - 2(1)$

$y = 1 - 2 = -1$

$\therefore DP(1;-1)$

$q(x) = y = 4 - x^2$ ∩

y-afs: $(0;4)$

x-afs: $0 = 4 - x^2$

$0 = (2-x)(2+x)$

$x = 2$ of $x = -2$

simm-as: $x = \frac{2+(-2)}{2} = 0$

DP: $y = 4 - (0)^2$

$y = 4$

$\therefore DP(0;4)$

(b) Bepaal die volgende aan die hand van die grafieke in (a):

(i) Definisieversameling van p. (iii) Min/Maks waarde van q.

(ii) Waardeversameling van q. (iv) x as $p(x) = q(x)$.

(i) D_p: $x \in \mathbb{R}$ (iii) Maks. waarde van 4

(ii) W_q: $y \leq 4$ (iv) By $A(2;0)$

en $B(-1;3)$

B1.2.1.2 Standaardvorm 2:

$y = a(x - p)^2 + q$

Invloed van a: [Vorm!]

As $a > 0$:  en as $a < 0$: 

Invloed van p: [Simmetrie-as!]

Simm-as se vergelyking: $x = p$

Invloed van q: [Min/Maks!]

q verteenwoordig die y-koördinaat van die draaipunt. $\therefore$ DP $= (p ; q)$

Vb. 2 Skets die volgende: $y = (x - 1)^2 - 4$

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Stap 1 *[Interpreteer die vorm]:* $a > 0$ $\therefore$ 

Stap 2 *[Bepaal die draaipunt se koördinate]:* $DP = (p ; q) = (1 ; -4)$

Stap 3 *[Bepaal x-afsnit(te)]:* Stel $y = 0$

$\therefore\ 0 = (x - 1)^2 - 4$ *of* $0 = (x - 1)^2 - 4$

$4 = (x - 1)^2$ $0 = x^2 - 2x + 1 - 4$

$\pm\sqrt{4} = x - 1$ $0 = x^2 - 2x - 3$

$\pm 2 = x - 1$ $0 = (x - 3)(x + 1)$

$\therefore\ x = +2 + 1$ *of* $x = -2 + 1$ $x = 3$ *of* $x = -1$

$x = 3$ $x = -1$ $\therefore$ *x-afsnitte:* $(3 ; 0)$ *en* $(-1 ; 0)$

Stap 4 *[Bepaal y-afsnit]:* Stel $x = 0$

$\therefore\ y = (0 - 1)^2 - 4$

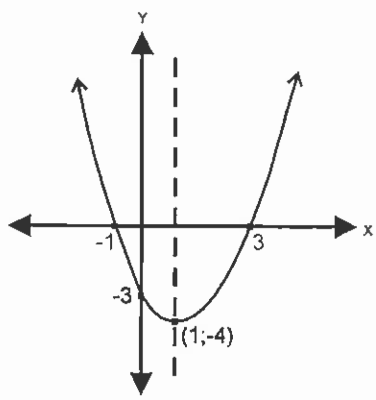
$\therefore\ y = (-1)^2 - 4$

$\therefore\ y = 1 - 4$

$\therefore\ y = -3$

$\therefore$ *y-afsnit:* $(0 ; -3)$

Stap 5 *[Teken grafiek!]*



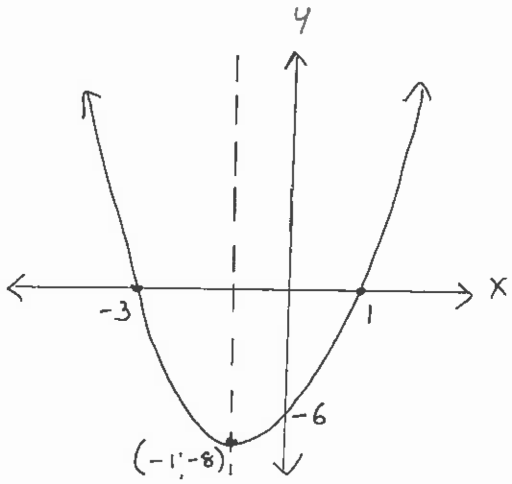
Afleidings:

Min waarde van -4

Def vers: $x \in R$

Waarde vers: $y \geq -4$

(1)(a)



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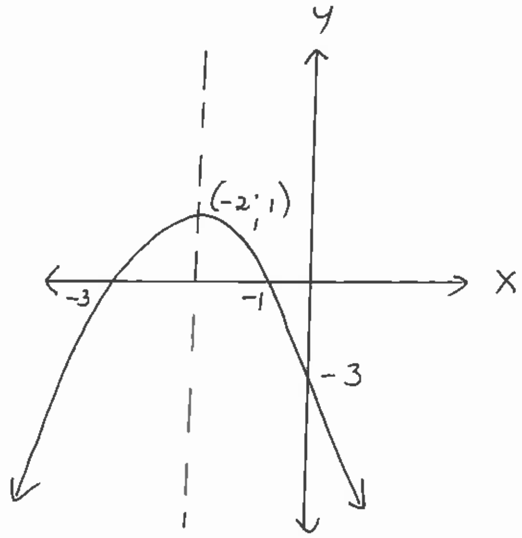

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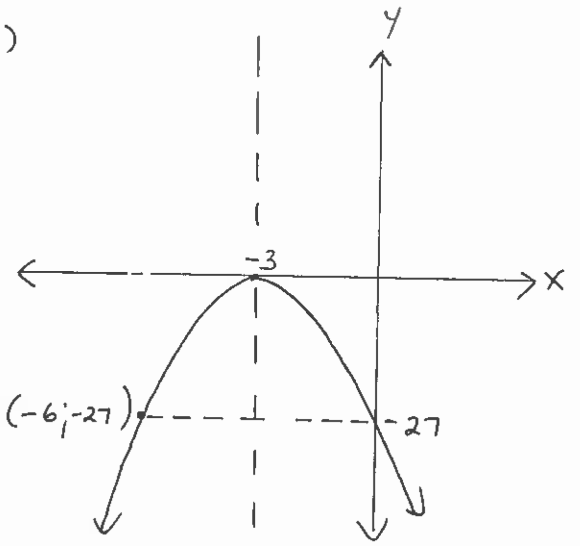

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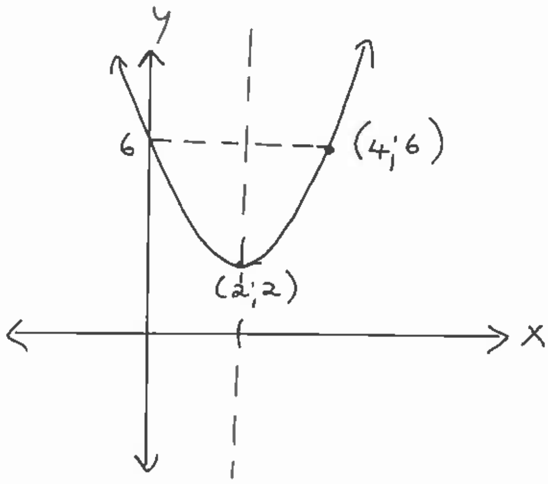

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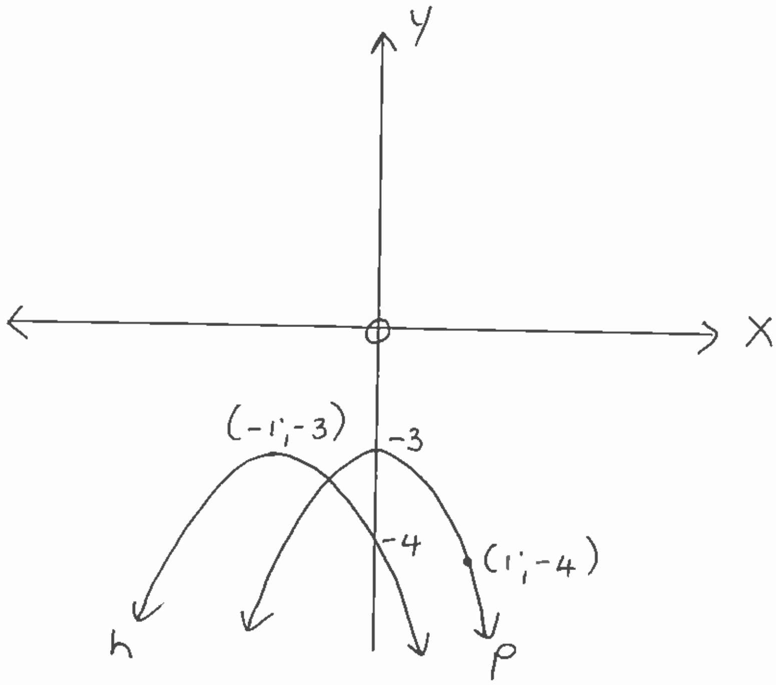


Oefening 3: Datum:__________

(1) Skets die volgende funksies op verskillende assestelsels: (Skets links!)

(a) $y = 2(x+1)^2 - 8$ Vorm: ∪

DP: $(-1;-8)$

x-afs: $0 = 2(x+1)^2 - 8$

$8 = 2(x+1)^2$

$4 = (x+1)^2$

$\pm 2 = x+1$

$\therefore x = 1$ of $x = -3$

y-afs: $y = 2(0+1)^2 - 8$

$= 2(1)^2 - 8$

$y = -6$

(b) $y = -(x+2)^2 + 1$ Vorm: ∩

DP: $(-2;1)$

x-afs: $0 = -(x+2)^2 + 1$

$(x+2)^2 = 1$

$x+2 = \pm 1$

$x = -1$ of $x = -3$

y-afs: $y = -(0+2)^2 + 1$

$y = -(2)^2 + 1$

$y = -4 + 1$

$y = -3$

(c) $y = -3(x+3)^2$ Vorm: ∩

DP: $(-3;0)$

x-afs: $0 = -3(x+3)^2$

$0 = (x+3)^2$

$\therefore x = -3$ of $x = -3$

y-afs: $y = -3(0+3)^2$

$y = -3(3)^2$

$y = -3(9)$

$y = -27$

(d) $y = (x-2)^2 + 2$ Vorm: ∪

DP: $(2;2)$

x-afs: $0 = (x-2)^2 + 2$

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

$\pm\sqrt{-2} = x-2$

Geen $\mathbb{R}$-opl $\therefore$ geen x-afs.

y-afs: $y = (0-2)^2 + 2$

$= 4 + 2$

$y = 6$

(2) Beskou: $h: x \rightarrow -(x+1)^2 - 3$

(a) Skets h. Toon alle berekeninge. Vorm: ∩

DP: $(-1;-3)$

x-afs: $0 = -(x+1)^2 - 3$

$(x+1)^2 = -3$

$x+1 = \pm\sqrt{-3}$

Geen $\mathbb{R}$-opl

$\therefore$ Geen x-afs.

y-afs:

$y = -(0+1)^2 - 3$

$y = -(1)^2 - 3$

$y = -1 - 3$

$y = -4$

(b) Skets $p(x) = -x^2 - 3$ op dieselfde assestelsel as (a).

$\therefore y = -(x+0)^2 - 3$ ∩

DP: $(0;-3)$

y-afs: $(0;-3)$

x-afs: $0 = -x^2 - 3$

$x^2 = -3$

$x = \pm\sqrt{-3}$

Geen x-afs.

(c) Beskryf die transformasie van h na p soos in die grafiek van (a) en (b). Watter invloed het sodanige transformasie op die vergelykings van h na p:

h skuif 1 eenheid na regs om p te verkry. Die maks. waarde van -3 bly dieselfde, maar simm-as skuif na regs.

(d) Bepaal die vergelyking van die reguitlyn deur die draaipunte van die twee parabole:

$y = -3$

(e) Skryf die waardeversamelings van h en p neer:

$W_p: y \leq -3$ $\quad W_h: y \leq -3$

B1.2.1.3 <u>Standaardvorm 3</u>:

$$y = a(x - x_1)(x - x_2)$$

<u>Invloed van a</u>: [Vorm!]

As $a > 0$:  en as $a < 0$: 

<u>Invloed van x_1 en x_2</u> : [x-afsnitte!]

Parabool sny x-as by x_1 en x_2.

Vb. 3 Skets die volgende: $y = 2(x - 3)(x + 1)$
****

<u>Stap 1</u> *[Interpreteer die vorm]:* $a > 0 \quad \therefore$ 

<u>Stap 2</u> *[Bepaal die x-afsnitte]:* $x_1 = 3$ *en* $x_2 = -1$

$\therefore$ *x-afsnitte:* $(3 ; 0)$ *en* $(-1 ; 0)$

<u>Stap 3</u> *[Bepaal die vergelyking van die simmetrie-as]:* *simm-as* $= \dfrac{x_1 + x_2}{2}$

$$x = \frac{3 + (-1)}{2} = 1$$

<u>Stap 3</u> *[Bepaal die draaipunt se koördinate]:*
Vervang $x = 1$ *(simm-as) in vergelyking* $\therefore y = 2(1 - 3)(1 + 1)$

$\therefore y = 2(-2)(2) = -8$

$\therefore DP = (1 ; -8)$

<u>Stap 4</u> *[Bepaal y-afsnit]: Stel* $x = 0$

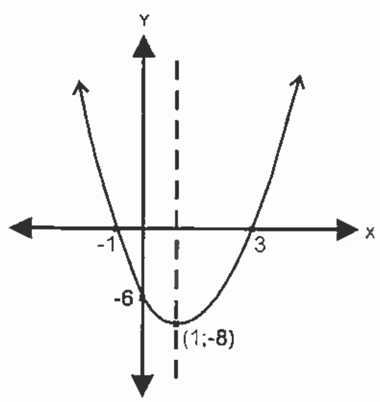
$\therefore y = 2(0 - 3)(0 + 1)$

$\therefore y = 2(-3)(1)$

$\therefore y = -6$

$\therefore$ *y-afsnit:* $(0 ; -6)$

<u>Stap 5</u> *[Teken grafiek!]*



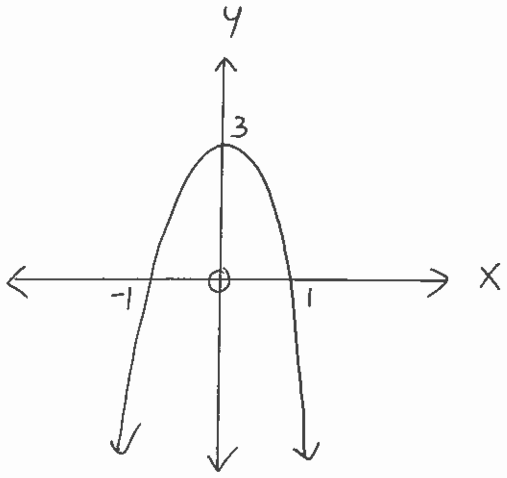
<u>Afleidings</u>:

Min waarde van -8

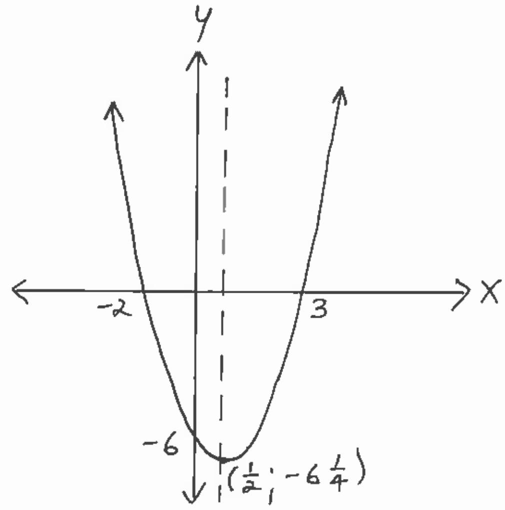
Def vers: $x \in R$

Waarde vers: $y \geq -8$

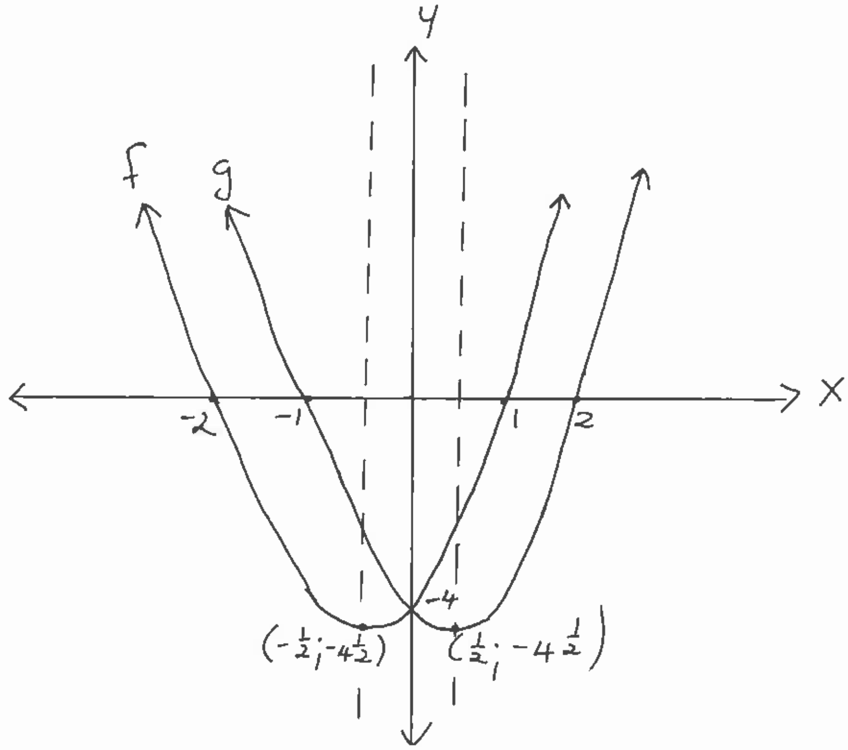
(1)(a)


y
3
x
-1
1

(b)


y
x
-2
3
-6
$(\frac{1}{2}; -6\frac{1}{4})$

(2)


y
f
g
x
-2
-1
1
2
-4
$(-\frac{1}{2}; -4\frac{1}{2})$
$(\frac{1}{2}; -4\frac{1}{2})$

Oefening 4: Datum:______________

(1) Skets die volgende funksies op verskillende assestelsels: (Skets links!)

(a) $y = -3(x + 1)(x - 1)$ Vorm: ∩

x-afs: $(-1;0)$ $(1;0)$

simm-as: $x = \frac{-1+1}{2} = 0$

DP: $y = -3(0+1)(0-1)$

$y = -3(1)(-1)$

$y = 3$

DP $(0;3)$

y-afs: $y = -3(0+1)(0-1)$

$\therefore y = 3$

(b) $y = (x + 2)(x - 3)$ Vorm: ∪

x-afs: $(-2;0)$ $(3;0)$

simm-as: $x = \frac{-2+3}{2} = \frac{1}{2}$

DP: $y = (\frac{1}{2}+2)(\frac{1}{2}-3)$

$= (2\frac{1}{2})(-2\frac{1}{2})$

$y = -6\frac{1}{4}$

DP $(\frac{1}{2}; -6\frac{1}{4})$

y-afs: $y = (0+2)(0-3)$

$y = (2)(-3)$

$y = -6$

(2) Beskou die volgende: $f(x) = 2(x - 1)(x + 2)$ en $g(x) = 2x^2 - 2x - 4$

(a) Skets f en g op dieselfde assestelsel.

f: x-afs: $(1;0)$ $(-2;0)$

simm-as: $x = \frac{1-2}{2} = -\frac{1}{2}$

DP: $y = 2(-\frac{1}{2}-1)(-\frac{1}{2}+2)$

$y = 2(-\frac{3}{2})(\frac{3}{2})$

$y = -4\frac{1}{2}$

$\therefore$ DP $(-\frac{1}{2}; -4\frac{1}{2})$

y-afs: $y = 2(0-1)(0+2)$

$y = 2(-1)(2)$

$y = -4$

g: x-afs: $0 = x^2 - x - 2$

$0 = (x-2)(x+1)$

$x = 2$ of $x = -1$

Simm-as: $x = \frac{2-1}{2} = \frac{1}{2}$

DP: $y = 2(\frac{1}{2})^2 - 2(\frac{1}{2}) - 4$

$y = -4\frac{1}{2}$

$\therefore$ DP $(\frac{1}{2}; -4\frac{1}{2})$

y-afs: $y = 2(0)^2 - 2(0) - 4$

$y = -4$

(b) Skryf g in die vorm $g(x) = a(x - x_1)(x - x_2)$

$g(x) = 2x^2 - 2x - 4$

$g(x) = 2(x^2 - x - 2)$

$g(x) = 2(x-2)(x+1)$

(c) Beskryf die transformasie van f → g. Verduidelik ook die verband tussen die vergelykings van f en g en die transformasie.

f is g se refleksie in die y-as.
Die vergelykings van f en g is dieselfde behalwe die tekens in die hakies is omgeruil indien in die vorm $y = a(x - x_1)(x - x_2)$