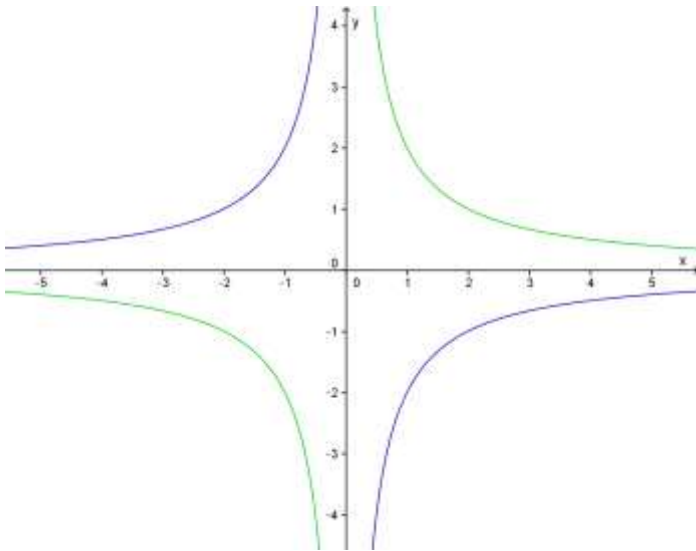


# SHARP

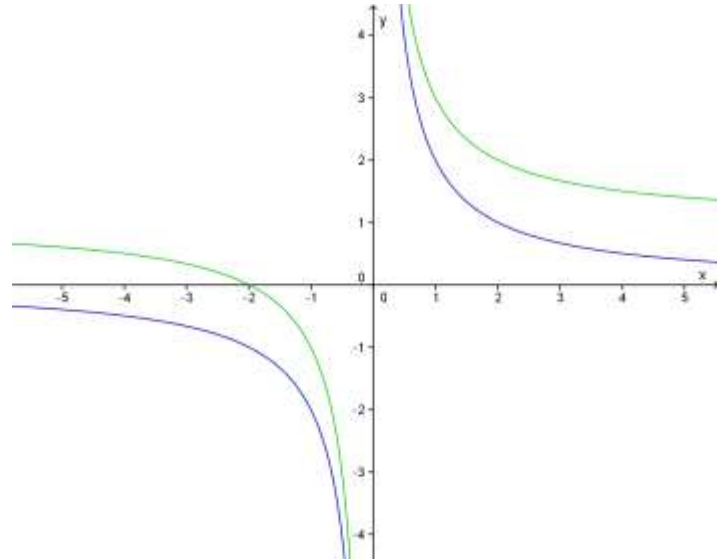
## Werkkaart 10 Memo – Funksies: Hiperbole, Parabole en Eksponensiële Grafieke

### Graad 10 – Wiskunde

1. a)  $y = \frac{2}{x}$  en  $y = \frac{-2}{x}$  b)  $y = \frac{2}{x}$  en  $y = \frac{2}{x} + 1$

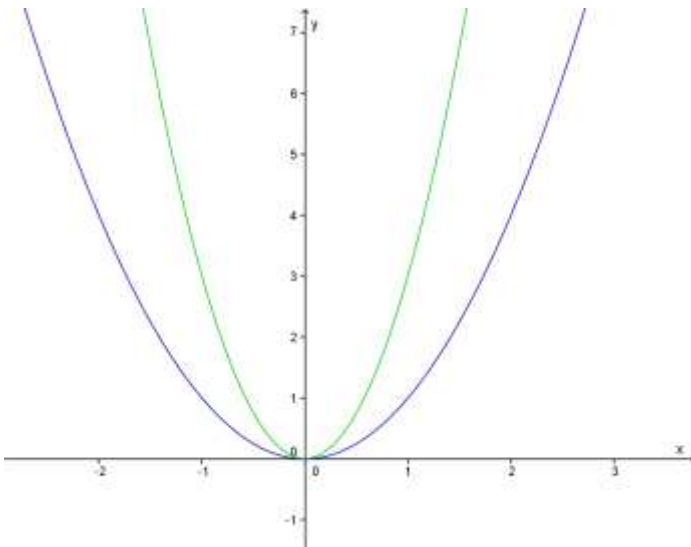


Die grafiek is gereflekteer oor y-as of die x-as.



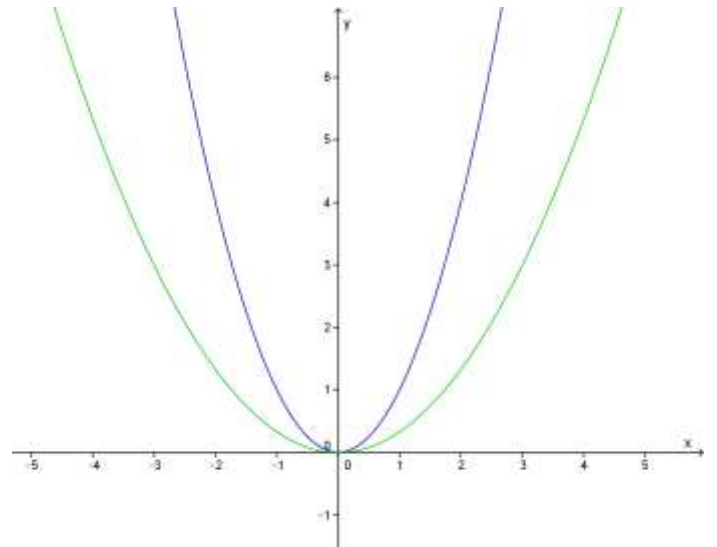
die grafiek is met 1 eenheid af geskuif

- c)  $y = x^2$  en  $y = 3x^2$



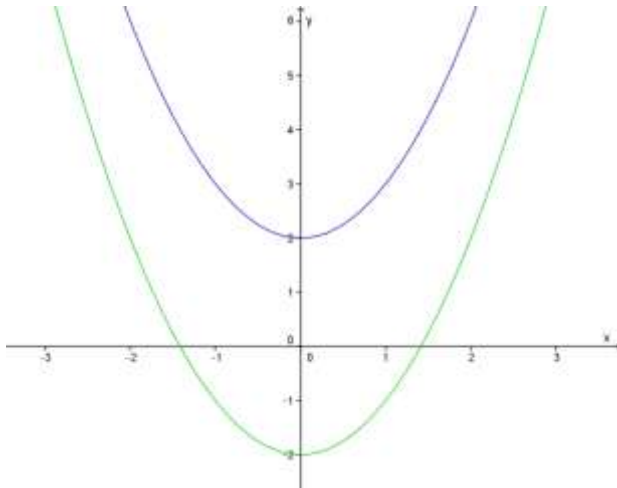
Die grafiek word nouer

- d)  $y = x^2$  en  $y = \frac{1}{3}x^2$



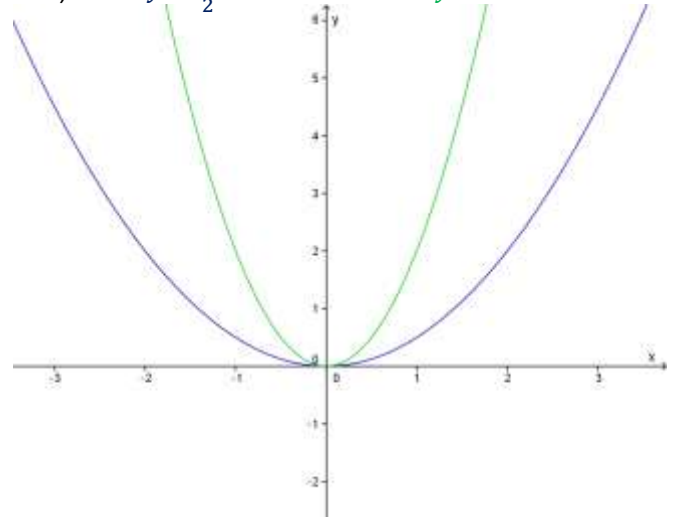
Die grafiek word vetter.

e)  $y = x^2 + 2$  en  $y = x^2 - 2$



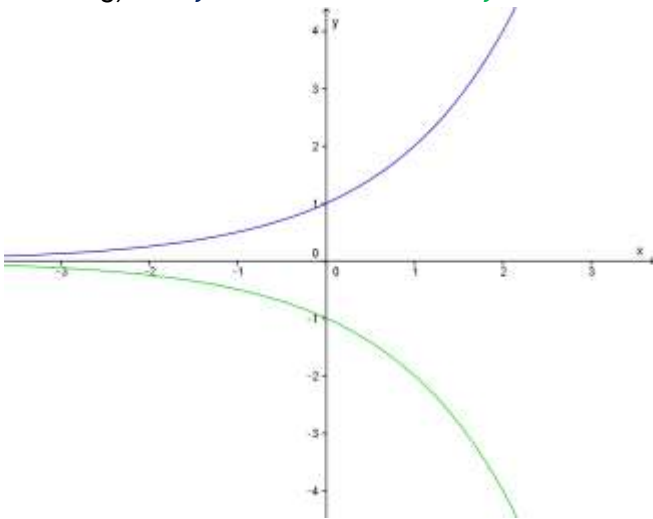
Die grafiek is 4 eenhede af geskuif,

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



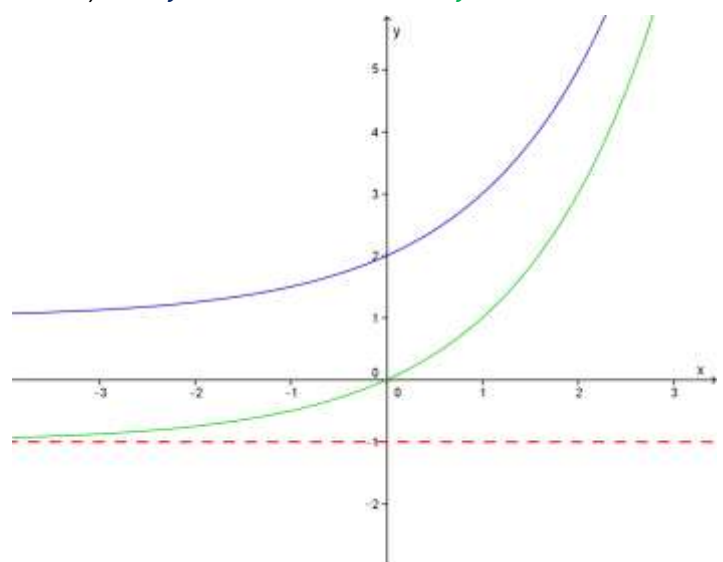
die grafiek het nouer geword

g)  $y = 2^x$  en  $y = -2^x$



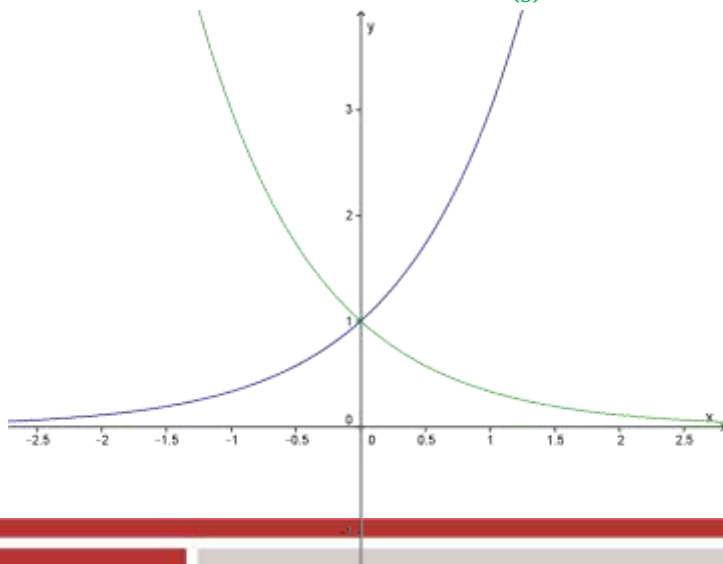
Die grafiek is om die y-as gereflekteer,

h)  $y = 2^x + 1$  en  $y = 2^x - 1$

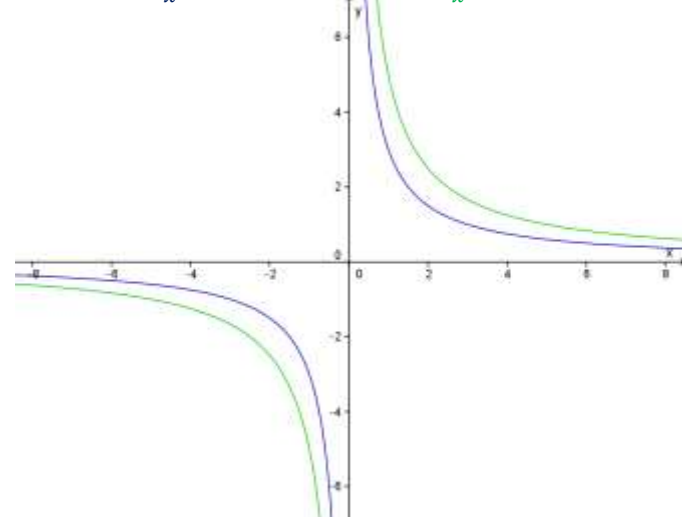


die grafiek is 2 eenhede af geskuif.

i)  $y = 3^x$  en  $y = \left(\frac{1}{3}\right)^x$



j)  $y = \frac{3}{x}$  en  $y = \frac{5}{x}$



Die grafiek is om die  $-x$  as gereflekteer.

Die grafiek beweeg verder van die asse af.

2. a)  $x = 0$  en  $y = 0$  b)  $x = 0$  en  $y = 1$   
c) daar is geen asimptote nie d)  $x = 0$  en  $y = 0$   
e)  $y = 0$  f)  $x = 0$  en  $y = -3$   
g)  $y = 1$  h)  $y = 0$   
i)  $x = 0$  en  $y = 2$  j)  $x = 0$  en  $y = -1$
3. a)  $y = x$  en  $y = -x$  b)  $y = x$  en  $y = -x$   
c)  $y = x + 1$  en  $y = -x + 1$  d)  $x = 0$   
e)  $x = 0$  f)  $x = 0$   
g) geen simmetrie-as h)  $y = x$  en  $y = -x$   
i)  $y = x - 1$  en  $y = -x - 1$  j)  $y = x + 2$  en  $y = -x + 2$
4. a) Definisie.  $\rightarrow x \in R; x \neq 0$  b) Definisie.  $\rightarrow x \in R; x \neq 0$   
Waarde.  $\rightarrow y \in R; y \neq 0$  Waarde.  $\rightarrow y \in R; y \neq 0$   
c) Definisie.  $\rightarrow x \in R; x \neq 0$  d) Definisie.  $\rightarrow x \in R$   
Waarde.  $\rightarrow y \in R; y \neq 1$  Waarde.  $\rightarrow y \geq 0$   
e) Definisie.  $\rightarrow x \in R$  f) Definisie.  $\rightarrow x \in R$   
Waarde.  $\rightarrow y \geq 0$  Waarde.  $\rightarrow y \geq 2$   
g) Definisie.  $\rightarrow x \in R$  h) Definisie.  $\rightarrow x \in R; x \neq 0$   
Waarde.  $\rightarrow y > 0$  Waarde.  $\rightarrow y \in R; y \neq 0$   
i) Definisie.  $\rightarrow x \in R; x \neq 0$  j) Definisie.  $\rightarrow x \in R; x \neq 0$   
Waarde.  $\rightarrow y \in R; y \neq -1$  Waarde.  $\rightarrow y \in R; y \neq 2$
5. a)  $(0; 0)$  b)  $(0; 0)$   
c)  $(0; 2)$  d)  $(0; -1)$
6. a)  $y = \frac{k}{x} + q$   $\left(-9; -\frac{1}{3}\right)$  en  $(3; 1)$   
 $-\frac{1}{3} = \frac{k}{-9} + q$  en  $1 = \frac{k}{3} + q$   
 $3 = k - 9q$   $3 = k + 3q \dots 2$

$$3 + 9q = k \dots 1$$

Subs 1 in 2

$$\therefore 3 = 3 + 9q + 3q$$

$$\therefore 0 = 12q$$

$$\therefore q = 0$$

$$\therefore y = \frac{3}{x}$$

Subs terug in 1

$$\therefore 3 + 9(0) = k$$

$$\therefore k = 3$$

b)  $y = ax^2 + q$  (0; 3) en (3; 12)

$$\therefore y = ax^2 + 3 \quad \text{Subs in (3; 12)}$$

$$\therefore 12 = a(3)^2 + 3$$

$$\therefore 9 = 9a$$

$$\therefore 1 = a$$

$$\therefore y = x^2 + 3$$

c)  $y = a^x + q$   $(-3; 1\frac{1}{8})$  en  $y = 1$

$$\therefore y = a^x + 1 \quad \text{Subs in } (-3; 1\frac{1}{8})$$

$$\therefore 1\frac{1}{8} = a^{-3} + 1$$

$$\therefore \frac{1}{8} = a^{-3}$$

$$\therefore 8 = a^3$$

$$\therefore \sqrt[3]{8} = a$$

$$\therefore a = 2$$

$$\therefore y = 2^x + 1$$

d)  $\perp$  tot  $y = \frac{1}{2}x + 3$  by (2; 4)

$$\therefore m_1 \times \frac{1}{2} = -1$$

$$\therefore m_1 = -2$$

$$\therefore y = -2x + c \quad \text{Subs in (2; 4)}$$

$$\therefore 4 = -2(2) + c$$

$$\therefore 8 = c \quad \therefore y = -2x + 8$$

e)  $y = \frac{k}{x} + q$  (-2; -4) en  $y = -2$

$$\therefore y = \frac{k}{x} - 2 \quad \text{Subs in (-2; -4)}$$

$$\therefore -4 = \frac{k}{-2} - 2$$

$$\therefore -2 = \frac{k}{-2}$$

$$\therefore k = 4 \qquad \therefore y = \frac{4}{x} - 2$$

f)  $y = ax^2 + q$       (-2; 7)      en (5; 49)

$$\begin{aligned} \therefore 7 &= a(-2)^2 + q & \text{en} & & 49 &= a(5)^2 + q \\ \therefore 7 &= 4a + q & & & 49 &= 25a + q \dots 2 \end{aligned}$$

$$\begin{aligned} \therefore 7 - 4a &= q \dots 1 & \text{Subs 1 in 2} & & & \\ & & \therefore 49 &= 25a + 7 - 4a & & \\ & & \therefore 42 &= 21a & & \\ & & \therefore 2 &= a & & \end{aligned}$$

Subs terug in 1:

$$\begin{aligned} \therefore 7 - 4(2) &= q \\ \therefore q &= 7 - 8 \\ \therefore q &= -1 & \therefore y &= 2x^2 - 1 \end{aligned}$$

g)  $y = \frac{k}{x} + q$       (-5; 3)      andy = 2

$$\therefore y = \frac{k}{x} + 2 \qquad \text{Subs in } (-5; 3)$$

$$\begin{aligned} \therefore 3 &= \frac{k}{-5} + 2 \\ \therefore 1 &= \frac{k}{-5} \\ \therefore k &= -5 & \therefore y &= -\frac{5}{x} + 2 \end{aligned}$$

h)  $y = -a^x$        $\left(-1; -\frac{1}{3}\right)$

$$\begin{aligned} \therefore -\frac{1}{3} &= -a^{-1} \\ \therefore \frac{1}{3} &= a^{-1} \\ \therefore 3 &= a & \therefore y &= -(3)^x \end{aligned}$$

i)  $y = ax^2 + q$       (-5; -21) en (0; 4)

$$\therefore y = ax^2 + 4 \qquad \text{Subs in } (-5; -21)$$

$$\begin{aligned} \therefore -21 &= a(-5)^2 + 4 \\ \therefore -25 &= 25a \\ \therefore a &= -1 & \therefore y &= -x^2 + 4 \end{aligned}$$

j)  $y = mx + c$        $\therefore m = \frac{y_2 - y_1}{x_2 - x_1}$       (-4; -17)

$$\therefore m = \frac{-17 - (-2)}{-4 - 1} \qquad (1; -2)$$

$$\therefore m = \frac{-15}{-5} = 3$$

$$\begin{aligned} \therefore y &= 3x + c && \text{Subs in (1; -2)} \\ \therefore -2 &= 3(1) + c \\ \therefore c &= -5 && \therefore y = 3x - 5 \end{aligned}$$

7. a) Definisiev.  $\rightarrow x \in R; x \neq 0$       b) Definisiev.  $\rightarrow x \in R$   
 Waardev.  $\rightarrow y \in R; y \neq 0$       Waardev.  $\rightarrow y \geq 3$
- c) Definisiev.  $\rightarrow x \in R$       d) Definisiev.  $\rightarrow x \in R$   
 Waardev.  $\rightarrow y > 1$       Waardev.  $\rightarrow y \in R$
- e) Definisiev.  $\rightarrow x \in R; x \neq 0$       f) Definisiev.  $\rightarrow x \in R$   
 Waardev.  $\rightarrow y \in R; y \neq -2$       Waardev.  $\rightarrow y \geq -1$
- g) Definisiev.  $\rightarrow x \in R; x \neq 0$       h) Definisiev.  $\rightarrow x \in R$   
 Waardev.  $\rightarrow y \in R; y \neq 2$       Waardev.  $\rightarrow y < 0$
- i) Definisiev.  $\rightarrow x \in R$       j) Definisiev.  $\rightarrow x \in R$   
 Waardev.  $\rightarrow y \leq 4$       Waardev.  $\rightarrow y \in R$

8. a)  $g(x) = mx + c$       A (-1; 0)  
 B (0; 2)  $\rightarrow y$ -afsnit  $\therefore c = 2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\therefore m = \frac{2 - 0}{0 - (-1)}$$

$$\therefore m = \frac{2}{1}$$

$$\therefore m = 2 \qquad \therefore g(x) = 2x + 2$$

En  $f(x) = ax^2 + b$       A (-1; 0)  
 E (0; 5)  $\rightarrow y$ -afsnit  $\therefore b = 5$

$$\therefore 0 = a(-1)^2 + 5$$

$$\therefore -5 = a \qquad \therefore f(x) = -5x^2 + 5$$

- b)  $\therefore g(x) = f(x)$   
 $\therefore 2x + 2 = -5x^2 + 5$   
 $\therefore 0 = -5x^2 - 2x + 5 - 2$   
 $\therefore 0 = -5x^2 - 2x + 3$   
 $\therefore 0 = 5x^2 + 2x - 3$

$$\therefore 0 = (5x - 3)(x + 1)$$

$$\therefore x = \frac{3}{5} \quad \text{OF} \quad x = -1 \rightarrow A$$

$$\therefore y = 2\left(\frac{3}{5}\right) + 2$$

$$\therefore y = \frac{6}{5} + 2 = 3\frac{1}{5}$$

$$\therefore C\left(\frac{3}{5}; 3\frac{1}{5}\right)$$

c)  $EB = 5 - 2$   
 $= 3$  eenhede

d)  $x = 0$

e)  $\perp$  aan  $g(x)$   $m_g = 2$

$$\therefore m_h \times 2 = -1$$

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

$$\therefore y = -\frac{1}{2}x + c \quad \text{Subs in D (1; 0)}$$

$$\therefore 0 = -\frac{1}{2}(1) + c$$

$$\therefore c = \frac{1}{2}$$

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

f)  $g(x) = h(x)$

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

$$\therefore \frac{5}{2}x = -\frac{3}{2}$$

$$\therefore x = -\frac{3}{5} \quad \text{en}$$

$$y = 2\left(-\frac{3}{5}\right) + 2$$

$$y = -\frac{6}{5} + 2$$

$$y = \frac{4}{5} \quad \therefore g(x) \text{ en } h(x) \text{ sny by } \left(-\frac{3}{5}; \frac{4}{5}\right)$$

En  $h(x) = f(x)$

$$\therefore -\frac{1}{2}x + \frac{1}{2} = -5x^2 + 5$$

$$\therefore 0 = -5x^2 + \frac{1}{2}x + 4\frac{1}{2}$$

$$\therefore 0 = 10x^2 - x - 9$$

$$\therefore 0 = (10x + 9)(x - 1)$$

$$\therefore x = -\frac{9}{10} \quad \text{OF} \quad x = 1 \rightarrow D(1; 0). \quad \text{en} \quad y = -\frac{1}{2}\left(-\frac{9}{10}\right) + \frac{1}{2}$$

$$\therefore y = \frac{19}{20} \quad \left(-\frac{9}{10}; \frac{19}{20}\right)$$

9. a)  $m(x) = \frac{k}{x} + q$

En  $p(x) = mx + c$  (0; 3)

$$\therefore m(x) = \frac{k}{x} + 1 \quad \text{Subs in } (-3; 0)$$

$$\therefore p(x) = mx + 3 \quad \text{Subs in } (-3; 0)$$

$$\therefore 0 = \frac{k}{-3} + 1$$

$$\therefore 0 = m(-3) + 3$$

$$\therefore -1 = \frac{k}{-3}$$

$$\therefore -3 = -3m$$

$$\therefore k = 3$$

$$\therefore m(x) = \frac{3}{x} + 1$$

$$\therefore m = 1$$

$$\therefore p(x) = x + 3$$

$$\begin{aligned} \text{b)} \quad p(x) &= m(x) && \therefore x + 3 = \frac{3}{x} + 1 \\ & && \therefore x^2 + 3x = 3 + x \\ & && \therefore x^2 + 2x - 3 = 0 \\ & && \therefore (x + 3)(x - 1) = 0 \\ &&& \therefore x = -3(\text{B}) \quad \text{en} \quad x = 1 && \therefore y = 1 + 3 = 4 \\ &&& && \therefore A(1; 4) \end{aligned}$$

$$\text{c)} \quad x = 0 \qquad \qquad \text{d)} \quad y = x + 1 \quad \text{en} \quad y = -x + 1$$

$$\begin{aligned} \text{e)} \quad m &= 1 \\ q(x) &= x + c && \text{Subs in } (-1; 0) \\ \therefore 0 &= -1 + c \\ \therefore x &= 1 && \therefore y = x + 1 \end{aligned}$$

f) Die lyn in vraag e is een van die simmetrie-asse vir die funksie van  $m(x)$

$$\begin{aligned} \text{g)} \quad q(x) &= m(x) \\ \therefore x + 1 &= \frac{3}{x} + 1 \\ \therefore x &= \frac{3}{x} \\ \therefore x^2 &= 3 \\ \therefore x &= \pm\sqrt{3} \\ \therefore y &= 1 + \sqrt{3} && \text{Of} && y = 1 - \sqrt{3} \\ \therefore q(x) &\text{ sny } m(x) && \text{by die punte } (\sqrt{3}; 1 + \sqrt{3}) && \text{en } (-\sqrt{3}; 1 - \sqrt{3}). \end{aligned}$$