Lösungen Blatt 5:

Afg 1

a) Gerade durch die Punkte $P = (2; -1)$ und $Q = (5; 8)$

$$f(x) = mx + b$$

$$\begin{aligned} \text{I.} \quad -1 &= f(2) = 2m + b \\ \text{II.} \quad 8 &= f(5) = 5m + b \end{aligned}$$

$\text{II} - \text{I}: \quad 9 = 3m \Rightarrow m = 3$

in I eingesetzt: $\quad -1 = 6 + b \Rightarrow b = -7$

$\Rightarrow f(x) = 3x - 7$

---

b) Gerade durch den Punkt $P = (-1; 5)$ mit Steigung -4

$$g(x) = -4x + b$$

P eingesetzt ergibt:

$$5 = g(-1) = -4(-1) + b = 4 + b \Rightarrow b = 1$$

$\Rightarrow g(x) = -4x + 1$

oder mit Punktsteigungsform:

$$\begin{aligned} g(x) &= m(x - x_0) + y_0 \quad \text{, wobei } g \text{ durch } (x_0, y_0) \text{ geht} \\ &= -4(x+1) + 5 \\ &= -4x + 1 \end{aligned}$$

c) Gerade durch die Punkte $(2;0)$ und $(0;-8)$

$$h(x) = mx + b$$

I. $0 = h(2) = 2m + b$

II. $-8 = h(0) = b$

---

in I eingesetzt: $0 = 2m - 8 \Rightarrow m = 4$

$\Rightarrow h(x) = 4x - 8$

---

d) $f(x) = h(x) \Leftrightarrow 3x - 7 = 4x - 8$

$\Leftrightarrow x = 1$

$\Rightarrow y = f(1) = h(1) = 3 - 7 = -4$

$\Rightarrow$ Schnittpunkt $P = (1;-4)$

Afg 2

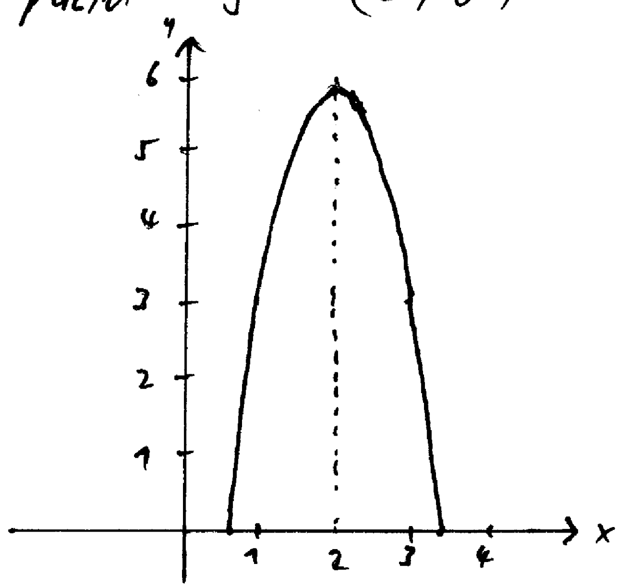
a) $f(x) = -3x^2 + 12x - 6$

$= -3(x^2 - 4x + 2)$

$= -3\left((x-2)^2 - 4 + 2\right) = -3\left((x-2)^2 - 2\right)$

$= -3(x-2)^2 + 6$

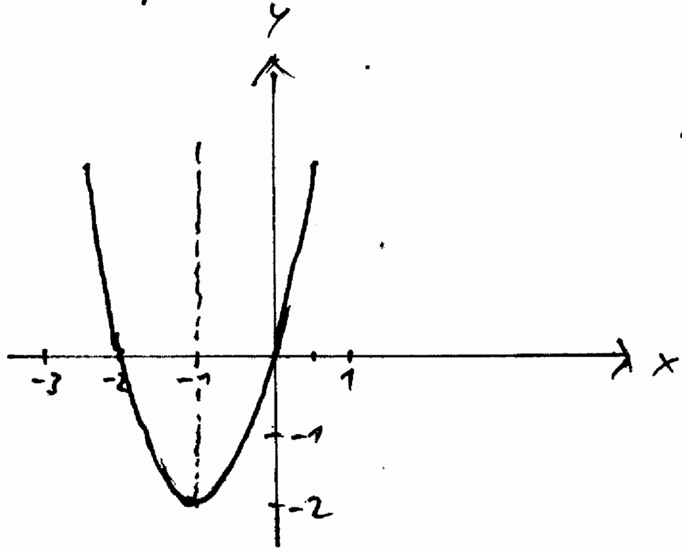
Scheitelpunkt $S = (2;6)$



b) $g(x) = 2x^2 + 4x = 2(x^2 + 2x)$

$= 2\left((x+1)^2 - 1\right) = 2(x+1)^2 - 2$

Scheitelpunkt $S = (-1; -2)$



c) Parabel mit Scheitelpunkt $S = (1; 3)$ und $f(\frac{1}{2}) = 0$
d.h. durch $(\frac{1}{2}; 0)$

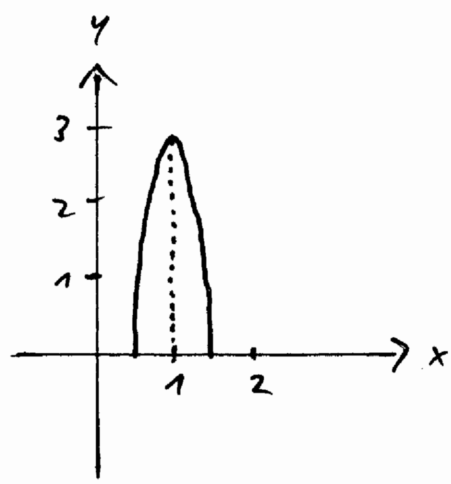
$f(x) = a(x-1)^2 + 3$

$0 = f(\frac{1}{2}) = a(\frac{1}{2} - 1)^2 + 3 = \frac{a}{4} + 3$

$\Rightarrow \quad \frac{a}{4} = -3 \Rightarrow a = -12$

$\Rightarrow f(x) = -12(x-1)^2 + 3 = -12(x^2 - 2x + 1) + 3$

$= -12x^2 + 24x - 9$

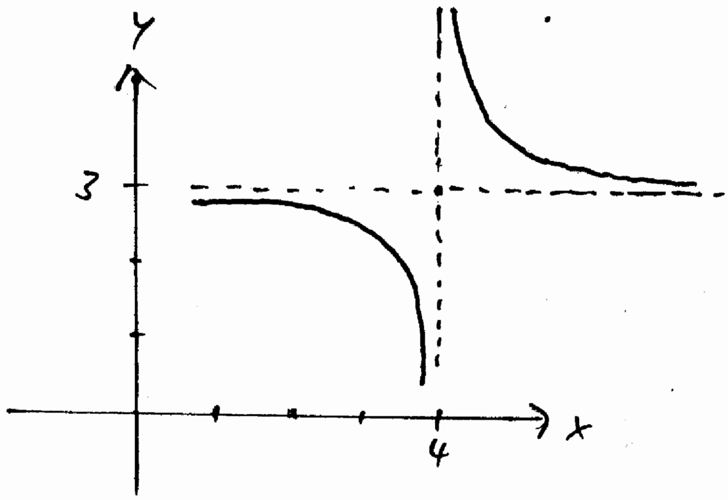


Afg 3

$$f(x) = \frac{3x-10}{x-4}$$

	3	−10
4	0	12
	3	2

$$\Rightarrow f(x) = 3 + \frac{2}{x-4} \qquad \mathbb{D} = \mathbb{R} \setminus \{4\}$$

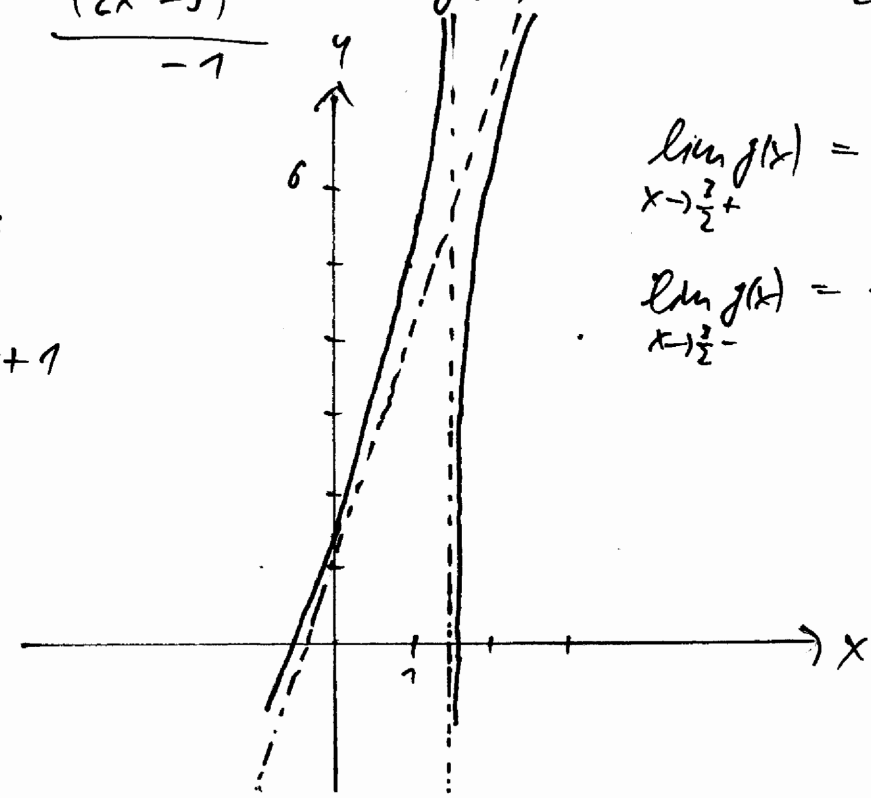


Asymptoten:
$x = 4$
$y = 3$

$$g(x) = \frac{6x^2-7x-4}{2x-3} \quad ; \quad \mathbb{D} = \mathbb{R} \setminus \left\{\tfrac{3}{2}\right\}$$

$$(6x^2-7x-4) : (2x-3) = 3x+1-\frac{1}{2x-3}$$
$$-(6x^2-9x)$$
$$2x-4$$
$$-(2x-3)$$
$$-1$$

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



$$\lim_{x\to\frac{3}{2}+} g(x) = \frac{9}{2}+1-\frac{1}{0+} = -\infty$$

$$\lim_{x\to\frac{3}{2}-} g(x) = \frac{9}{2}+1-\frac{1}{0-} = \infty$$

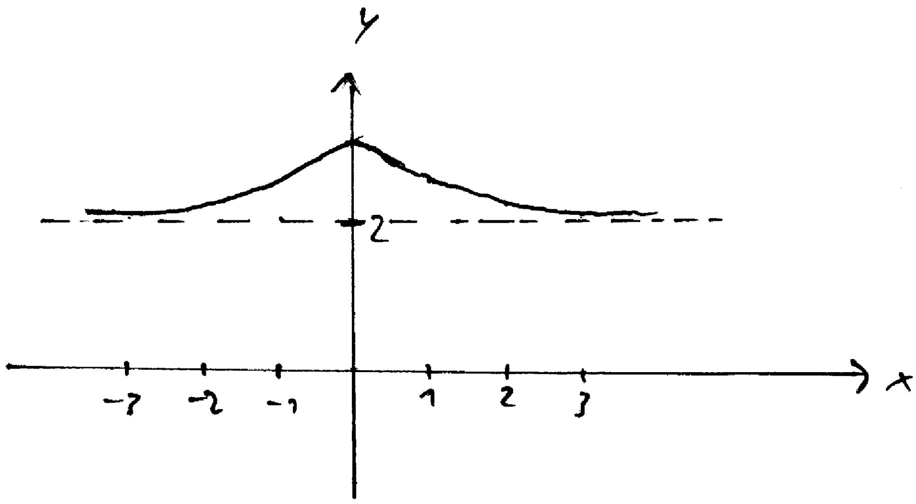
Asymptoten:
$x = \frac{3}{2}$
$a(x) = 3x+1$

$$h(x) = \frac{2x^2+3}{x^2+1} \quad ; \quad \mathbb{D} = \mathbb{R}$$

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

$$\Rightarrow \quad h(x) = 2 + \frac{1}{x^2+1} \leq 3$$

$$\lim_{x \to \pm\infty} h(x) = 2 \quad ; \quad h(0) = 3$$



Asymptote : $y = 2$