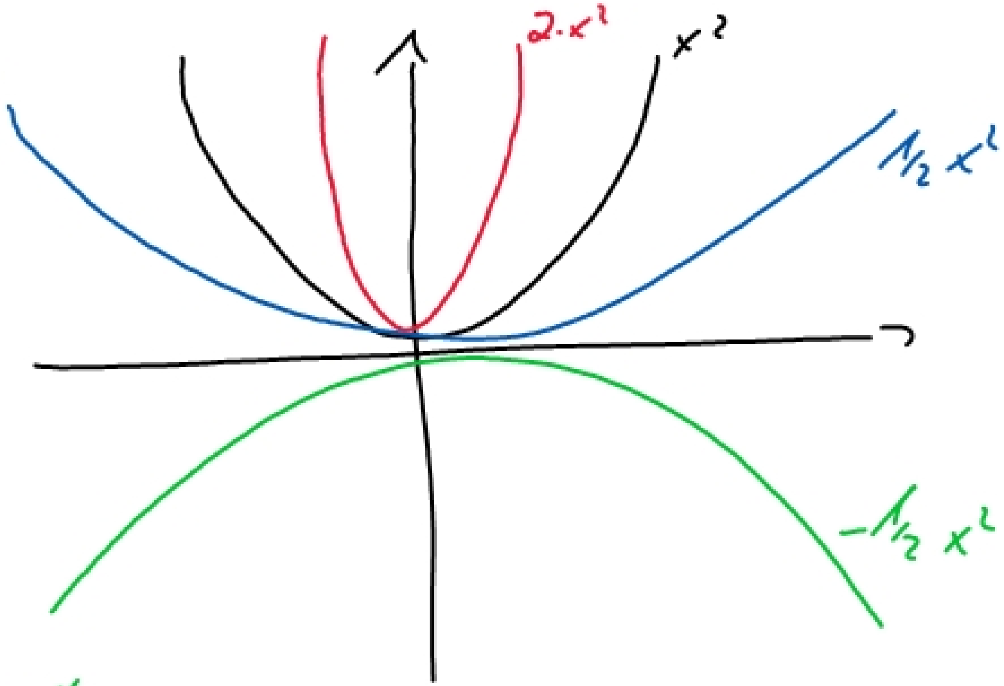
Parameter Variable

$f_a(x) = a \cdot x^2$

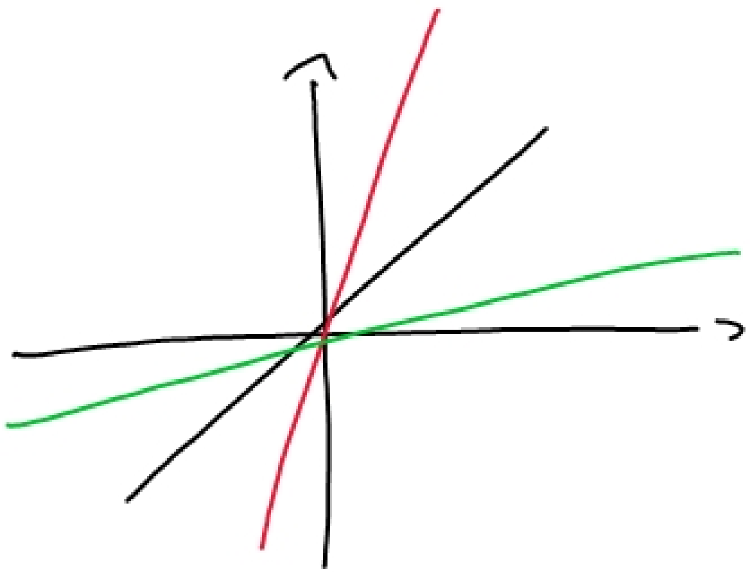


$|a| > 1$: gestreckt

$|a| < 1$: gestaucht

$a < 0$: unten geöffnet

$a > 0$: oben geöffnet



$f_x(a) = a \cdot x^2$

$42 \cdot \alpha \cdot x^3 \rightarrow$ Variable

Koeffizient $\qquad \rightarrow$ Parameter

c) d) f) i) 2)

c) $(2x - 0{,}5xy)(2x + 0{,}5xy) = 4x^2 - 0{,}25x^2y^2$

d) $(2cd - \frac{3}{c}d)^2 = 4c^2d^2 - 12d^2 + \frac{9}{c^2}d^2$

f) $(\frac{1}{3}x - 0{,}1y)(\frac{1}{3}x + 0{,}1y) = \frac{1}{9}x^2 - 0{,}01y^2$

i) $(\frac{1}{4}i - 0{,}2x)(\frac{1}{4}i + 0{,}2x) = -\frac{1}{16} - 0{,}04x^2$

2) $(3b - ab)(3b + ab) - (a - 2b)^2$

$9b^2 - a^2b^2 - (a^2 - 4ab + 4b^2) = 5b^2 + 4ab - a^2b^2 - a^2$

Grenzwerte

$$f(x) = 2 + \frac{1}{x-1} \quad ; \mathbb{D} = \mathbb{R} \setminus \{1\}$$

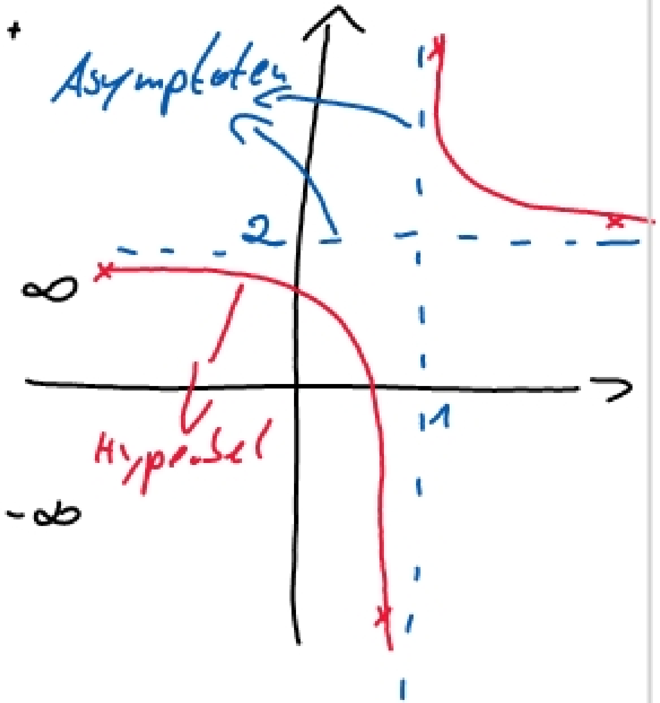
$$\lim_{x \to -\infty} f(x) = \left[2 + \frac{1}{-\infty - 1}\right] = \left[2 + 0^-\right] = 2^-$$

$$\frac{k}{0} = \infty \quad ; \quad \frac{k}{\infty} = 0$$

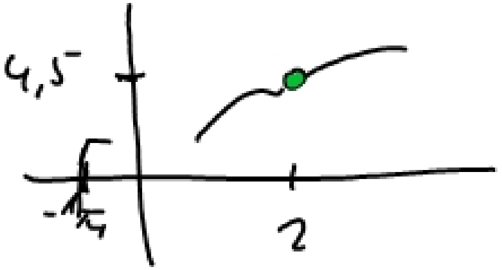
$$\lim_{x \to \infty} f(x) = \left[2 + \frac{1}{\infty - 1}\right] = \left[2 + 0^+\right] = 2^+$$

$$\lim_{x \to 1^+} f(x) = \left[2 + \frac{1}{1^+ - 1}\right] = \left[2 + \frac{1}{0^+}\right] = \infty$$

$$\lim_{x \to 1^-} f(x) = \left[2 + \frac{1}{1^- - 1}\right] = \left[2 + \frac{1}{0^-}\right] = -\infty$$



$$f(x) = \frac{3x-6}{\underbrace{\sqrt{4x+1}}_{\geq 0}-3} \quad , \quad D = \mathbb{R}^{\geq -1/4} \setminus \{2\}$$



$$\lim_{x\to 2} f(x) = 0/0 \qquad (x-2)$$

$$f(x) = \begin{cases} \frac{3x-6}{\sqrt{4x+1}-3} \; ; & x \geq -1/4 \wedge x \neq 2 \\ 4,5 \; ; & x = 2 \end{cases}$$

NR: $$\frac{3\cdot(x-2)}{\underbrace{\sqrt{4x+1}-3}_{a\;-\;b}} \cdot \frac{\sqrt{4x+1}+3}{\underbrace{\sqrt{4x+1}+3}_{a\;+\;b}}$$

$$\frac{3\cdot\cancel{(x-2)}\cdot(\sqrt{4x+1}+3)}{\underbrace{4x+1-9}_{a^2\;-\;b^2} = 4x-8 = 4\cdot\cancel{(x-2)}}$$

$$\lim_{x\to 2} \frac{3\cdot(\sqrt{4x+1}+3)}{4} = 9/2$$

6)

$$f(x) = \frac{x^2-4x-12}{2\cdot\underbrace{\sqrt{2x+4}}_{=0\ -\ x=-2}-8} \qquad D = \mathbb{R}^{\geq -2} \setminus \{6\}$$

$$\lim_{x\to 6} f(x) = \frac{0}{0} \longrightarrow (x-6)$$

$\underline{NR:}$

$$\frac{(x+2)(x-6)}{2\cdot\sqrt{2x+4}-8} \cdot \frac{2\cdot\sqrt{2x+4}+8}{2\cdot\sqrt{2x+4}+8}$$

$$\frac{(x+2)(x-6)\cdot(2\cdot\sqrt{2x+4}+8)}{4\cdot(2x+4)-64} \quad = 8x+16-64 = 8\cdot(x-6)$$

$$\lim_{x\to 6} \frac{(x+2)\cdot(2\cdot\sqrt{2x+4}+8)}{8} = 16 \qquad (6/16)$$

Pascal'sche Dreieck

$$(a+b)^n$$

$$(2x - 1/2)^4$$

$$(2x - 1/2)^2 \cdot (2x - 1/2)^2$$

n											
0						1					
1					1		1				
2				1		2		1			
3			1		3		3		1		
4 $\rightarrow$		1		4		6		4		1	
5	1		5		10		10		5		1

Koeffizienten-Struktur

$$1(2x)^4\left(-\tfrac{1}{2}\right)^0 + 4(2x)^3\left(-\tfrac{1}{2}\right) + 6(2x)^2\left(-\tfrac{1}{2}\right)^2 + 4(2x)^1\left(-\tfrac{1}{2}\right)^3 + 1(2x)^0\left(-\tfrac{1}{2}\right)^4$$

$$16x^4 - 16x^3 + 6x^2 - x + 1/16$$

$$(2i-1)^5$$

$$1(2i)^5(-1)^0 + 5(2i)^4(-1)^1 + 10(2i)^3(-1)^2 + 10(2i)^2(-1)^3 + 5(2i)^1(-1)^4 + 1(-1)^5$$

$$32i \quad - 80 \quad - 80i \quad + 40 \quad + 10i \quad - 1$$

$$-41 - 38i$$

$$\alpha = \arctan\left(\frac{38}{41}\right) + \pi$$