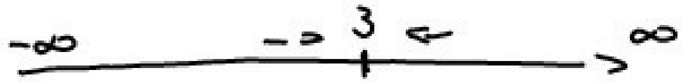
$$f(x) = \underbrace{\frac{2}{x-3}}_{\text{Hyperbel}} - 2 \qquad \mathbb{D} = \mathbb{R} \setminus \{3\}$$

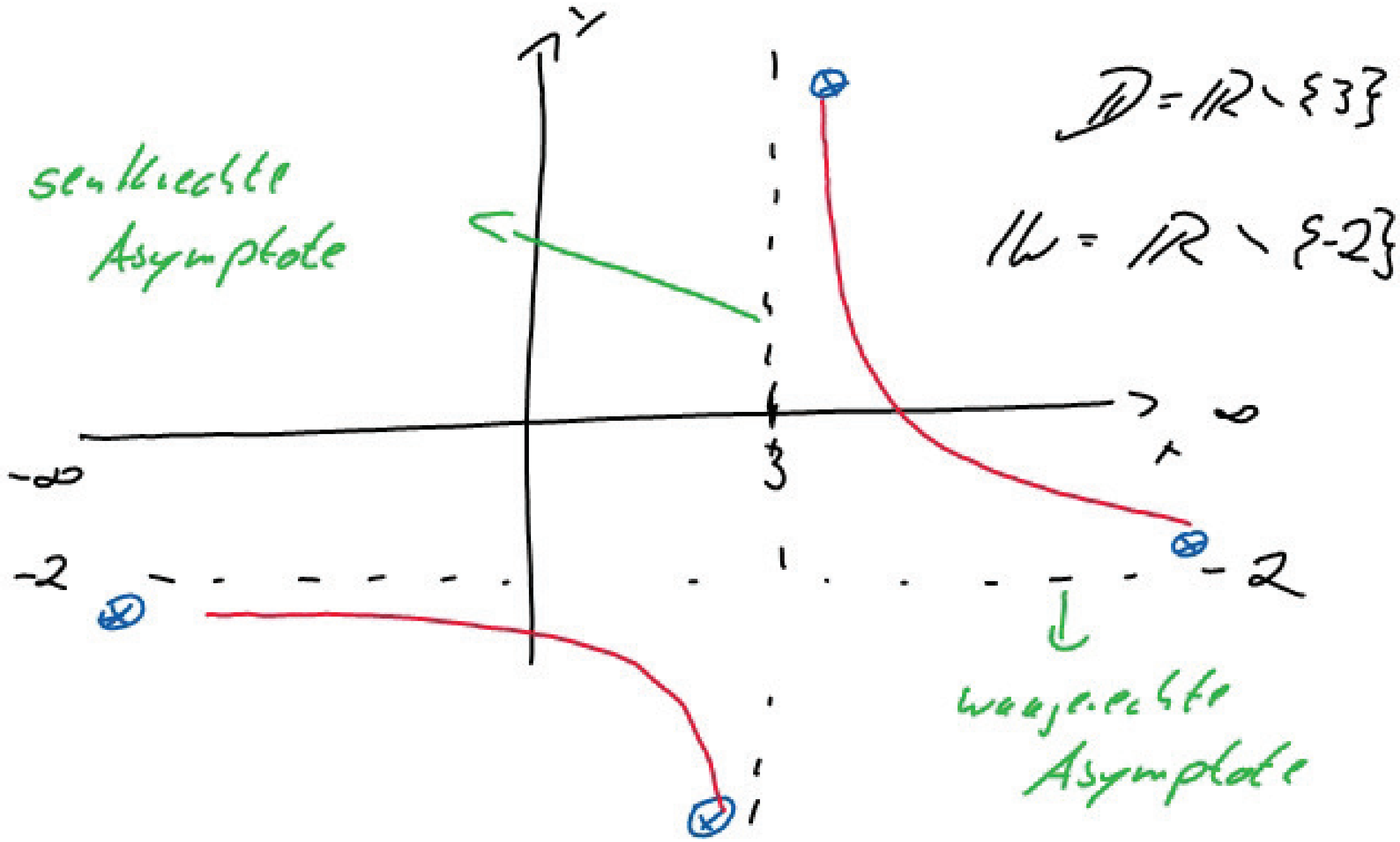


$$\lim_{x \to -\infty} f(x) = \left[\frac{2}{-\infty} - 2\right] = \left[0^- - 2\right] = -2^-$$

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

$$\lim_{x \to 3^-} f(x) = \left[\frac{2}{3^- - 3} - 2\right] = \left[\frac{2}{0^-} - 2\right] = -\infty$$

$$\lim_{x \to 3^+} f(x) = \left[\frac{2}{3^+ - 3} - 2\right] = \left[\frac{2}{0^+} - 2\right] = \infty$$



y
x
$-\infty$
∞
3
-2
-2
senkrechte Asymptote
waagerechte Asymptote
$\mathbb{D} = \mathbb{R} \setminus \{3\}$
$\mathbb{W} = \mathbb{R} \setminus \{-2\}$

a) $4x^2 - 0{,}4xy + 0{,}01y^2$

b) $a^2x^2 + 6axy + 9y^2$

c) $4x^2 - \frac{1}{4}x^2y^2$

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

$4c^2d^2 - 12d^2 + 9 \cdot \frac{d^2}{c^2}$

f) $\frac{1}{9}x^2 - \frac{1}{100}y^2$

e) $\frac{x^2}{16} + x^2y + 4x^2y^2$

g) $4i^2 - 20i + 25$ $\quad (-4)\quad +$

$21 - 20i$

h) $0{,}16i^2 + 6{,}4i + 64$

$63{,}84 + 6{,}4i$

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

$-\frac{1}{16} - 0{,}04x^2$

1) 4) $3 \cdot \left(\frac{1}{9}x^2 - 4y^2 \right) - 4 \cdot \left[4\frac{x^2}{y^2} + 12x + 9y^2 \right]$

$\frac{1}{3}x^2 - 12y^2 - 16\frac{x^2}{y^2} - 48x - 36y^2$

$\frac{1}{3}x^2 - 16\frac{x^2}{y^2} - 48x - 48y^2$

$\dots - (a - 2b)^2$

$(-a + 2b)(a - 2b)$

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

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

$= \frac{3\sqrt{x} - \sqrt{27} \cdot x + 2 - \sqrt{12x}}{1 - 3x}$

4)
$$\frac{\sqrt{x}-2\sqrt{1-x}}{2\sqrt{3x}-4}\cdot\frac{2\sqrt{3x}+4}{2\sqrt{3x}+4}$$

$$\frac{2\sqrt{x}\cdot\sqrt{3x}+4\sqrt{x}-4\sqrt{1-x}\cdot\sqrt{3x}-8\cdot\sqrt{1-x}}{4\cdot 3x-16}$$

$$\frac{2x\sqrt{3}+4\cdot\sqrt{x}-4\cdot\sqrt{3x-3x^2}-8\cdot\sqrt{1-x}}{12x-16}$$

5)
$$\lim_{x\to -3}\left(\frac{\overset{(x+3)}{2x+6}}{6-2\sqrt{3-2x}}\right)\cdot\frac{(6+2\cdot\sqrt{3-2x})}{6+2\cdot\sqrt{3-2x}}$$

$$\frac{2\cdot(x+3)\cdot(6+2\sqrt{3-2x})}{36-4\cdot(3-2x)}=\frac{2\cdot(6+2\sqrt{3-2x})}{8}=3$$

$$36-12+8x$$

$$24+8x=8\cdot(3+x)$$

$$\lim_{x \to 6} \left[\frac{x^2 - 4x - 12}{2 \cdot \sqrt{2x+4} - 8} \right]$$

$$(x + a)(x + b)$$
$$(x - 6)(x + 2)$$

Vieta

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

$$4 \cdot (2x+4) - 64$$
$$8x + 16 - 64$$
$$8x - 48 = 8 \cdot (x-6)$$

$$\frac{(x+2) \cdot [2\sqrt{2x+4} + 8]}{8} = \frac{8 \cdot [16]}{8} = 16$$

$$(2x+y)^4 = (2x+y)^2 \cdot (2x+y)^2$$

$$(4x^2+4xy+y^2)(4x^2+4xy+y^2)$$

0						1						
1					1		1					
2				1		2		1				
3			1		3		3		1			
4		1		4		6		4		1		
	1		5		10		10		5		1	

$$1(2x)^4y^0 + 4(2x)^3y^1 + 6(2x)^2y^2 + 4(2x)^1y^3 + 1(2x)^0y^4$$

$$16x^4 + 32x^3y + 24x^2y^2 + 8xy^3 + y^4$$

1) $(\boxed{2x} + \tfrac{1}{3})^3$

$1(2x)^3(\tfrac{1}{3})^0 + 3(2x)^2(\tfrac{1}{3})^1 + 3(2x)^1(\tfrac{1}{3})^2 + 1(2x)^0(\tfrac{1}{3})^3$

$8x^3 + 4x^2 + \tfrac{2}{3}x + \tfrac{1}{27}$

$+$

$(\tfrac{1}{6} + x)^2$

$1(\tfrac{1}{6})^2 x^0 + 2(\tfrac{1}{6})^1 x^1 + 1(\tfrac{1}{6})^0 x^2$

$\tfrac{1}{36} + \tfrac{1}{3}x + x^2$

$27 = \boxed{3 \cdot 3} \cdot 3$

$36 = \boxed{3 \cdot 3} \cdot 2 \cdot 2$

$8x^3 + 5x^2 + x + \dfrac{7}{108}$

$\boxed{3 \cdot 3} \cdot 3 \cdot 2 \cdot 2$

4) $(2+i)^5$

$1\,2^5 i^0 + 5\,2^4 i^1 + 10\,2^3 i^2 + 10\,2^2 i^3 + 5\,2^1 i^4 + 1\,2^0 i^5$

$32 + 80i + 80(-1) + 40\cdot(-i) + 10 + i$

$-38 + 41i$