$$\lim_{x \to 3} \frac{x^2 - 5x + 6}{2\sqrt{19-x} - (2x+2)}$$

a) 3. Bino-

b) L'Hospital

10:05

$(x-3)$

$$\lim_{x \to 3} \frac{(x-3)(x-2)}{2\cdot\sqrt{19-x} - (2x+2)} \cdot \frac{2\cdot\sqrt{19-x} + (2x+2)}{2\cdot\sqrt{19-x} + (2x+2)}$$

$$\lim_{x \to 3} \frac{(x-3)(x-2)\cdot\left[2\cdot\sqrt{19-x} + (2x+2)\right]}{4\cdot(19-x) - (2x+2)^2} = \frac{1\cdot\left[2\cdot\sqrt{16} + (8)\right]}{-4 \cdot 9}$$

$$76 - 4x - (4x^2 + 8x + 4)$$

$$-4x^2 - 12x + 72$$

$$-4(x^2 + 3x - 18)$$

$$-4 \cdot (x-3)(x+6)$$

$$= \frac{16}{-4\cdot 9} = -\frac{4}{9}$$

$$\lim_{x \to 3} \frac{x^2 - 5x + 6}{2 \cdot \sqrt{19-x} - (2x+2)} = \lim_{x \to 3} \frac{2x - 5}{\frac{\cancel{2}}{\cancel{2} \cdot \sqrt{19-x}} \cdot (-1) - 2}$$

$$= \frac{6-5}{\frac{-1}{\sqrt{16}} - 2} = \frac{1}{-\frac{1}{4} - 2} = \frac{1}{-\frac{9}{4}} = -\frac{4}{9}$$

Interpretation von Grenzwerten bei Funktionen

$$f(x) = \dots \quad ; \quad \mathbb{D} = \mathbb{R} \setminus \{k\}$$

$x \to$ \ $f(x)$	k	$\pm\infty$
k	behebbare Lücke	senkrechte Asymptote
$\pm\infty$	waagerechte Asymptote	diagonale Asymptote

$$f(x) = \frac{x^3-7x^2+2x+40}{x^2-x-12}$$

=> Gesamtbetrachtung

=> Interpretation

=> Achsenschnittpunkte

=> Skizze

D: $x^2-x-12=0 = (x-4)(x+3)$

$D_f = \mathbb{R} \setminus \{-3;4\}$

$z(-3) \neq 0 \quad ; \quad z(4)=0$

$$(x^3-7x^2+2x+40):(x-4) = \underbrace{x^2-3x-10}_{(x-5)(x+2)}$$

$$\begin{array}{l}
-(x^3-4x^2) \\
\hline
\quad -3x^2+2x+40 \\
\quad -(-3x^2+12x) \\
\hline
\qquad -10x+40 \\
\qquad -(-10x+40) \\
\hline
\end{array}$$

$$f(x) = \frac{(x-4)(x-5)(x+2)}{(x-4)(x+3)} \quad ; \quad D_f = \mathbb{R} \setminus \{-3; 4\}$$

$$f_e(x) = \frac{(x-5)(x+2)}{(x+3)} \quad ; \quad D_{f_e} = \mathbb{R} \setminus \{-3\}$$

$$\lim_{x \to 4^+} f(x) = \lim_{x \to 4^-} f(x) = f_e(4) = -6/7$$ => behebbare Lücke $(4 / -6/7)$

$$\lim_{x \to -3^+} f(x) = \left[\frac{8}{0^+}\right] = \infty$$

$$\lim_{x \to -3^-} f(x) = \left[\frac{8}{0^-}\right] = -\infty$$

senkrechte Asymptote

$$f_e(x) = \frac{(x-5)(x+2)}{x+3} = \frac{x^2-3x-10}{x+3}$$

$$\lim_{x\to\infty} f_e(x) = \lim_{x\to\infty} \frac{x^2\cdot(1-\underbrace{3/x}_{\to 0}-\underbrace{10/x^2}_{\to 0})}{x\,(1+\underbrace{3/x}_{\to 0})} = [x] = \infty$$

$$\lim_{x\to-\infty} f_e(x) = [x] = -\infty \longrightarrow$$ diagonale Asymptote

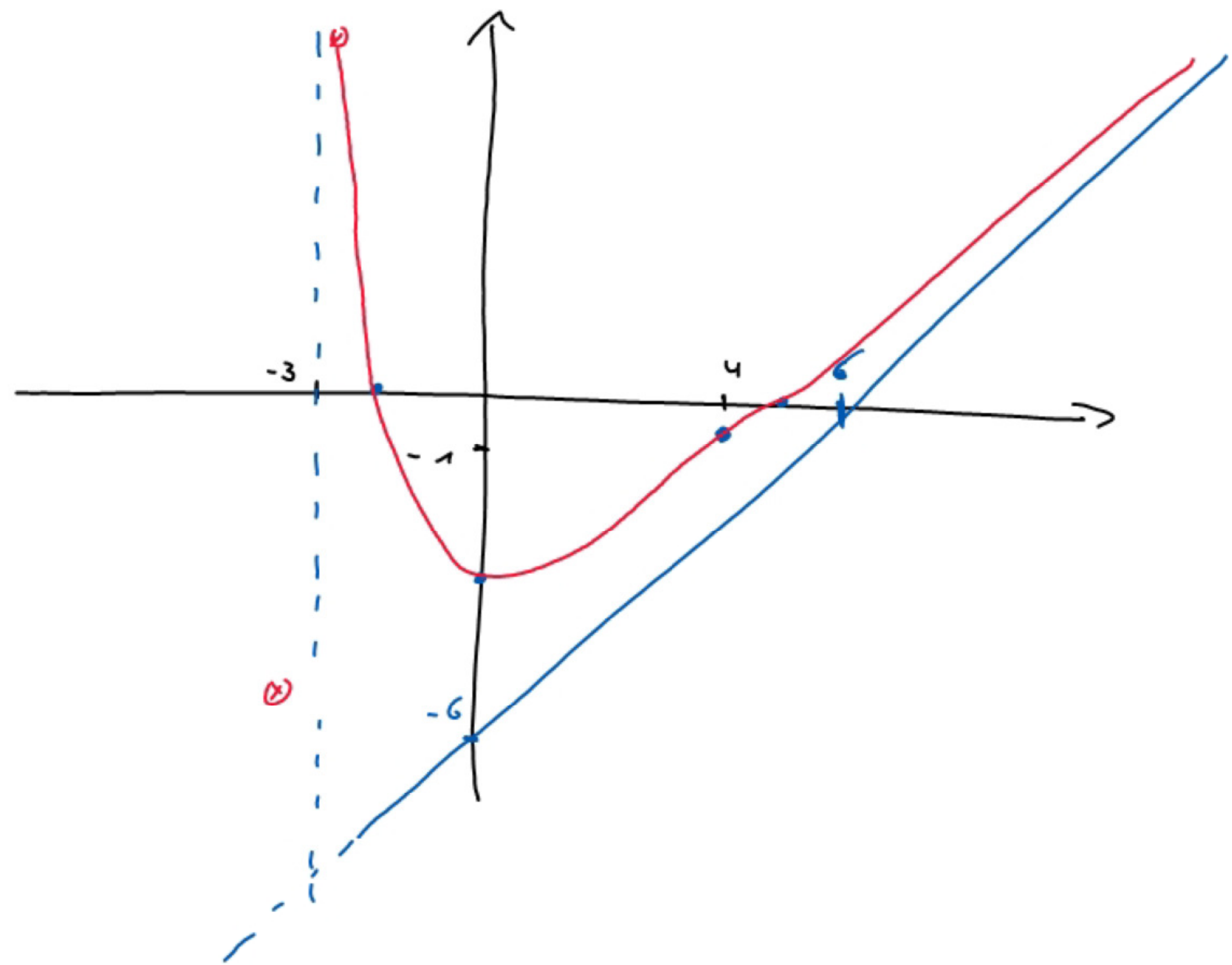
$$(x^2-3x-10):(x+3) = \underbrace{x-6}_{\text{diag. Asym.}} + \underbrace{\frac{8}{x+3}}_{0}$$

$$\begin{array}{l} -(x^2+3x) \\ \hline \quad -6x-10 \\ \quad -(-6x-18) \\ \hline \qquad 8 \end{array}$$

Achsenschnittpunkte:

x-Achse: $f(x)=0 \nearrow$ $NS_1: (5|0)$, $NS_2: (-2|0)$

y-Achse: $f(0) = f_e(0) = -10/3$



-3
4
6
-1
-6