Wochenplan

Woche 1

Teil 1: (I)

$$f(x) = \frac{-x^2 + 2x + 4}{x - 2{,}5}$$ &

$$p(x) = -x^2 + 2x + 4 = 0$$
$$\quad\ p \quad q$$

$$\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 - 4} \qquad / \qquad 1 \pm \sqrt{1^2 + 4}$$

$$1 \pm 2{,}23 = x_1 = 3{,}23$$
$$x_2 = -1{,}23$$

$$x - 2{,}5 = 0 \quad / + 2{,}5$$
$$x = 2{,}5$$

$$\mathbb{D} = \mathbb{R} \setminus \{2{,}5\}$$

Polstelle da $p(2{,}5) \neq 0$

Teil 2: (II)

$$f(x) = \frac{2x + 2}{x^2 - 6x + 9}$$

$$q(x) = x^2 - 6x + 9 = 0$$
$$\quad\ p \quad q$$

$$-\frac{(-6)}{2} \pm \sqrt{\left(\frac{-6}{2}\right)^2 - 9}$$
$$3 \pm \sqrt{9 - 9}$$
$$x_{1,2} = 3$$

$p(3) = 2 \cdot 3 + 2 = 8 \neq 0$

$\Rightarrow x = 3$ = Polstelle

Teil 3) (M)

$$f(x) = \frac{x^2 - x}{x^2 - 6x + 9}$$

$$(x^2 - x) : (x^2 - 6x + 9) = 1$$
$$-(x^2 - 6x + 9)$$
$$5x - 9$$

$$\Rightarrow f(x) = 1 + \frac{5x - 9}{x^2 - 6x + 9}$$

Teil 4:

2

Teil 5:

(1)

$$\frac{x - 2}{x^2 + 5 + 3}$$

weil $x - 2$ eine Nullstelle ist

Woche 2

Teil 1: (I)

$$f(x) = \frac{-x^2 + 2x + 4}{x - 2{,}5}$$

2

Teil 2: (II)

$$f(x) = \frac{2x + 2}{x^2 - 6x + 9}$$

$n_Z < n_N$

$1 < 2$

x-Achse = waagerecht Asymptote

Teil 3: (III)

$$f(x) = \frac{x^8 - 9x^2 + 3x^4 - 4x}{x^3 - 6x^2 + 9}$$

$x^8 - 9x^2 + 3x^4 - 4x : (x^3 - 6x^2 + 9) =$

$-(x^8$

$$f(x) = \frac{9x^4 + 2x^3 - 5x + 4}{x^2 - 3x}$$

$9x^4 + 2x^3 - 5x + 4 : (x^2 - 3x) = 9x^2 + 29x + 87$

$-(9x^4 - 27x^3)$

$29x^3 - 5x$

$-(29x^3 - 87x^2)$

$87x^2 - 5x$

$-(87x^2 - 261x)$

$256x + 4$

$$f(x) = 9x^2 + 29x + 87 + \frac{256x + 4}{x^2 - 3}$$

Teil 4: (1)

$$f(x) = \frac{3x-3}{x-1}$$

$$(3x-3) : x-1 = 3$$
$$-(3x-3)$$
$$0$$

Teil 5:

~~Teil 3:~~ Woche 3:

Teil 1)

a)

$$f(x) = \frac{4x^2 - 4}{x^2 - 4}$$

$4x^2 - 4 = 0$ $\quad x_1 = 1$, $x_2 = -1$

b)

$x^2 - 4 = 0$ $\quad x^2 = 4$ $\quad = x_3 = -2$, $x_4 = 2$

$p(x_3) = 0$ $\quad p(x_4) = 0$ $\quad$ = Polstellen

c)

$$\lim_{x \uparrow -2} f(x) = \frac{4x^2 - 4}{x^2 - 4} = \frac{12}{0^+} = +\infty$$

$$\lim_{x \downarrow -2} f(x) \quad \frac{4x - 4}{x^2 - 4} = \frac{12}{0^-} = -\infty$$

$$\lim_{x \uparrow 2} f(x) = \frac{4x^2 - 4}{x^2 - 4} = \frac{12}{0^-} = -\infty$$

$$\lim_{x \uparrow 2} f(x) = \frac{4x^2 - 4}{x^2 - 4} = \frac{12}{0^+} = +\infty$$

d)

$4x^2-4 : x^2-4 = 4$
$-(4x^2-16)$
12

$\lim_{x \to \pm\infty} = 4$

e)

$f(x) = 8x(x^2-4)^{-1} + (4x^2-4)\cdot(-1)(x^2-4)^{-2}\cdot(2x)$

$= \frac{8x}{x^2-4} + \frac{(4x^2-4)(-2x)}{(x^2-4)^2}$

$= \frac{8x(x^2-4)}{(x^2-4)^2} + \frac{-8x^3+8x}{(x^2-4)^2}$

$= \frac{8x^3-32x-8x^3-8x}{(x^2-4)^2} = \frac{24x}{(x^2-4)^2}$

$\Rightarrow f(x)=0 \quad -24x = 0 \quad \Rightarrow x = 0$

$f(0) = \frac{4\cdot 0^2-4}{0^2-4} = \frac{-4}{-4} = 1$

$f(-1) = f(1) = 0 \Rightarrow$ H(0|1) ist HOP

Teil 2

$f(x) = \frac{0,5x^2-8}{x-4}$

a)

$x-4=0 \qquad x=4$

$p(4) = 0,5\cdot 4^2 - 8 = 0,5 - 16 - 8 = 8-8 = 0$

$x_p = x_N \Rightarrow \quad x=4$ hebare Definitionslücke

b)

$f_1(x) = 0{,}5x^2 - 8 : x - 4$

$(0{,}5x^2 - 8) : x - 4 = 0{,}5x + 2$

$-(0{,}5x^2 - 2x)$

$2x - 8$

$-(2x - 8)$

0

$\lim_{x \to 4} f_1(x) = \lim_{x \to 4} 0{,}5x + 2 = 4$ 4

c)

Graph weist ~~Lücke auf~~ keine Lückenstelle auf, Bedeutet Nennerfunktion lässt sich im Zähler wiederfinden.

Teil 3 =

$f(x) = \frac{x^2 + 4x}{x - 2}$

a)

$x^2 + 4x = 0 \quad \Leftrightarrow \quad x(x+4) = 0 \quad = \quad x_1 = 0, \; x_2 = -4$

b)

$q(x) = 0 \quad x - 2 = 0 \quad x_3 = 2$ Polstelle

$p(2) = 2^2 + 4 \cdot 2 = 4 + 8 = 12 \neq 0$ 4

c)

$\lim_{x \uparrow 2} f(x) = \frac{x^2 + 4x}{x - 2} = \frac{12}{0} = -\infty$

$\lim_{x \downarrow 2} f(x) = \frac{x^2 + 4x}{x - 2} = \frac{12}{0+} = +\infty$

d)

$$x^2 + 4x : x - 2 = x + 6$$
$$-(x^2 - 2x)$$
$$6x$$
$$-(6x - 12)$$
$$12$$

$$As\,g(x) = x + 6$$

$$\lim_{x \to -\infty} = x + 6 = -\infty$$

$$\lim_{f \to \infty} = x + 6 = +\infty$$

c)

$$f(x) = (x^2 + 4x)(x-2)^{-1}$$

$$f'(x) = (2x+4)(x-2)^{-1} + (x^2+4x)\cdot(-1)(x-2)^{-2}\cdot 1$$

$$= \frac{2x+4}{x-2} + \frac{(x^2+4x)(-1)}{(x-2)^2}$$

$$= \frac{(2x+4)(x-2)}{(x-2)^2} + \frac{-x^2-4x}{(x-2)^2}$$

$$= \frac{2x^2 - 4x + 4x - 8 - x^2 - 4x}{(x-2)^2}$$

$$= \frac{x^2 - 4x - 8}{(x-2)^2}$$

$$f'(x) = x^2 - 4x - 8 = 0$$

$$x_{1,2} = -\frac{-4}{2} \pm \sqrt{\left(\frac{-4}{2}\right)^2 + 8} = 2 \pm \sqrt{4,88}$$

$$x_1 = 2 + \sqrt{12} \qquad x_2 = 2 - \sqrt{12}$$

$$f(x_1) = 14,93 \qquad f(x_2) = 1,07$$

$$H\,(5,46 / 14,93) \qquad T\,(-1,46 / 1,07)$$