HA 5 06.12.13

a) $\mathbb{D} = \mathbb{R} \setminus \{-1\}$

b) $\lim\limits_{\substack{x \to -1 \\ x > -1}} \underbrace{x-5}_{\to -6} + \frac{9}{\underbrace{x+1}_{\to +0}} = \underline{\underline{+\infty}}$

$\lim\limits_{\substack{x \to -1 \\ x < -1}} \underbrace{x-5}_{-6} + \frac{9}{\underbrace{x+1}_{-0}} = \underline{\underline{-\infty}}$

$\lim\limits_{x \to +\infty} \underbrace{x-5}_{\to \infty} + \frac{9}{\underbrace{x+1}_{\to 0}} = \underline{\underline{+\infty}}$

$\lim\limits_{x \to -\infty} \overbrace{x-5}^{-\infty} + \frac{9}{\underbrace{x+1}_{\to 0}} = \underline{\underline{-\infty}}$

c) $\frac{(x-5)\cdot(x+1)+9}{(x+1)} = \frac{x^2+x-5x-5+9}{x+1} = \frac{x^2-4x+4}{x+1}$ } zur Aufgabe d)

$\mathbb{D} = \mathbb{R} \setminus \{-1\}$

Senkrechte Asymptote bei $x = -1$

Schräge Asymptote $y = x-5$

d) $f(x) = x^2-4x+4 = 0$

$x_{1|2} = \frac{4 \pm \sqrt{(-4)^2-4\cdot 1\cdot 4}}{2\cdot 1} = \frac{4 \pm \sqrt{0}}{2}$ $S_x(2|0)$

$x_{1|2} = 2$

$f(0) = 0-5+\frac{9}{0+1} = \underline{\underline{4}}$ $S_y(0|4)$

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

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

$= \frac{x^2+2x-8}{(x+1)^2}$

$x^2+2x-8=0$ $x_{1|2} = \frac{-2 \pm \sqrt{(2)^2-4\cdot 1\cdot(-8)}}{2\cdot 1} = \frac{-2 \pm \sqrt{36}}{2}$

$x_1 = 2 \quad \vee \quad x_2 = -4$

x		-4		-1		2	
$(x-2)$	$-$		$-$		$-$	0	$+$
$(x+4)$	$-$	0	$+$		$+$		$+$
$(x+1)^2$	$+$		$+$	$\lightning$	$+$		$+$
f'	$+$		$-$		$-$		$+$
f	$\nearrow$	HP	$\searrow$		$\searrow$	TP	$\nearrow$

f ist streng monoton steigend für $x \leq -4$ und $x \geq 2$

f ist streng monoton abnehmend für $-4 \leq x < -1$ und $-1 \leq x \leq 2$

Hochpunkt: $-4-5+\frac{9}{-4+1} = -12 \Rightarrow (-4|-12)$

Tiefpunkt: $2-5+\frac{9}{2+1} = 0 \Rightarrow (2|0)$

f) $f(-6) = -6-5+\frac{9}{-6+1} = -12{,}8$

$f(-3) = -3-5+\frac{9}{-3+1} = -12{,}5$

$f(1) = 1-5+\frac{9}{1+1} = 0{,}5$

$f(6) = 6-5+\frac{9}{6+1} = 2{,}3$