

S123

$$1) \frac{1}{4} \log(256x^8) - 2 \cdot \log \frac{\sqrt{9}}{x^2} - 0,5 \cdot \log \frac{x^4}{9} = 1,5 \log(9x^4) + 3 \log \frac{1}{2x^3} + 4 \cdot \log \sqrt{27x}$$

$$\log(256x^8)^{1/4} - \log(3/2)^2 - \log(x^4/9)^{1/2} = \log(9x^4)^{3/2} + \log(1/2x^3)^3 + \log(\sqrt{27x})^4$$

$$\log \frac{4x^2}{3^{1/4} x^4 y^{2/3}} = \log 3^3 x^6 \cdot \frac{1}{2^3 x^9} \cdot 3^6 \cdot x^2 \quad | \uparrow^{10x}$$

$$\frac{4}{3} x^4 = 3^{9/2} \cdot \frac{1}{x} \quad | \cdot x \quad | \cdot 3/4$$

$$x^5 = 3^{10/2} \quad | \sqrt[5]{\quad}$$

$$x = 3^{2/2} = 9/2 \quad \mathbb{D} = \mathbb{R}^+ \quad \mathbb{L} = \{9/2\}$$

$$2) \quad 6 \cdot \ln \sqrt[3]{3} - 4 \cdot \left( \ln \sqrt{\frac{2}{x}} + \frac{1}{2} \cdot \ln \frac{9}{x} \right) = 2 \cdot \ln \frac{\sqrt{x^3}}{3} - 0,25 \cdot \ln (16x^9) + 3 \ln \frac{8}{x^2}$$

$$\ln (3^{1/3})^6 - \ln \left( \frac{2^{1/2}}{x^{1/2}} \right)^4 - \ln \left( \frac{9}{x} \right)^2 = \ln \left( \frac{x^{3/2}}{3} \right)^2 - \ln (16x^9)^{1/4} + \ln \left( \frac{8}{x^2} \right)^3$$

$$\ln \frac{3^{1/2}}{2^{1/2} \cdot 3^{4/2}} = \ln \frac{x^{3/2} \cdot 2^{2/4} \cdot 3^3}{2x^4 \cdot x} \quad | \uparrow \text{ex}$$


$$\frac{1}{2 \cdot 3^2} \cdot x^4 = \frac{2^8}{3^2} \cdot \frac{1}{x^5} \quad | \cdot x^5 \cdot 3^2 \cdot 2$$

$$x^9 = 2^9 \quad | \sqrt[9]{\quad}$$

$$x = 2$$

$$D = \mathbb{R}^+$$

$$L = \{2\}$$

$$3) f(x) = -\frac{1}{13} \cdot \ln(x^2 - 6x - 40) = -\frac{1}{13} \cdot \ln[(x-10)(x+4)]$$


$$\mathbb{D} = \{x \in \mathbb{R} \mid x > 10 \vee x < -4\}$$

$$\lim_{x \rightarrow 10^+} f(x) = \lim_{x \rightarrow -4^-} f(x) = \left[ -\frac{1}{13} \ln(0^+) \right] = -\frac{1}{13} \cdot (-\infty) = \infty$$

$$\lim_{x \rightarrow \pm\infty} f(x) = \left[ -\frac{1}{13} \cdot \ln \infty \right] = -\frac{1}{13} \cdot \infty = -\infty \quad \text{Kv} = y \in \mathbb{R}$$

$$4) f(x) = \log\left(\sqrt{2x+4} - 8\right) - 12$$

$x \geq -2$

$$\sqrt{2x+4} - 8 = 0 \quad | +8$$

$$\sqrt{2x+4} = 8 \quad | \uparrow^2$$

$$2x+4 = 64 \quad | -4$$

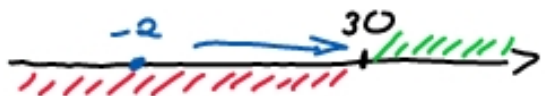
$$2x = 60 \quad | :2$$

$$x = 30$$

$$\lim_{x \rightarrow \infty} f(x) = \left[ \log(\infty - 8) - 12 \right] = \infty$$

$$\lim_{x \rightarrow 30^+} f(x) = \left[ \log(|64^+ - 8) - 12 \right] = -\infty$$

$$\text{Kv} = y \in \mathbb{R}$$



$$\mathbb{D} = x \in \mathbb{R}^{>30}$$

$$f(x) = x^2 + p \cdot x + q = (x+a)^2 + b \rightarrow S(-a | b)$$

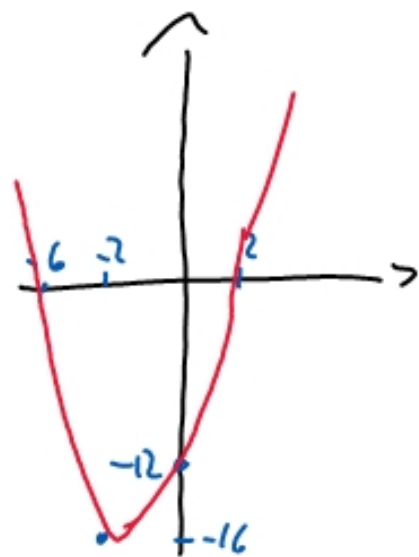
$\underbrace{x^2 + 2ax + a^2}$

$$f(x) = \underbrace{x^2}_{\square} + \underbrace{4x}_{\cdot 2} - 12 = (x+2)^2 - 2^2 - 12 = (x+2)^2 - 16$$

$S(-2 | -16)$   
TP

$$S_y: f(0) = -12$$

$$\begin{aligned} \text{NS: } x\text{-Achse: } f(x) = 0 &= (x+2)^2 - 16 && | +16 \\ 16 &= (x+2)^2 && | \sqrt{\phantom{x}} \\ \pm 4 &= x+2 && | -2 \\ x_1 = 2 &\vee x_2 = -6 \end{aligned}$$



$$f(x) = x^2 - 2x - 24 = (x-1)^2 - 1^2 - 24$$

$$= (x-1)^2 - 25$$

TP

$$S(1 | -25)$$

$$S_4(0 | -24)$$

S<sub>4</sub> ⇒

$$f(x) = 0$$

$$0 = (x-1)^2 - 25 \quad | +25$$

$$25 = (x-1)^2 \quad | \sqrt{\quad}$$

$$\pm 5 = x-1 \quad | +1$$

$$x_1 = 6 \quad \vee \quad x_2 = -4$$

$$S_{x_1}(6 | 0) ; S_{x_2}(-4 | 0)$$

$$f(x) = x^2 - 2x - 24 = (x-6)(x+4)$$

$$x_1 = 6 \quad \vee \quad x_2 = -4$$

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$$S(1 | f(x)) = S(1 | -25)$$

$$x^2 + \beta \cdot x + \gamma = \sigma$$

$$(x + \frac{\beta}{2})^2 - (\frac{\beta}{2})^2 + \gamma = \sigma \quad | + (\frac{\beta}{2})^2 - \gamma$$

$$(x + \frac{\beta}{2})^2 = (\frac{\beta}{2})^2 - \gamma \quad | \sqrt{\quad}$$

$$x + \frac{\beta}{2} = \pm \sqrt{(\frac{\beta}{2})^2 - \gamma} \quad | - \frac{\beta}{2}$$

$$x_{1/2} = -\frac{\beta}{2} \pm \sqrt{(\frac{\beta}{2})^2 - \gamma} \quad \beta = p ; \gamma = q$$

$$x^2 + p \cdot x + q = \sigma$$

$$x_{1/2} = -\frac{p}{2} \pm \sqrt{(\frac{p}{2})^2 - q}$$

$$5) \quad h(x) = \frac{3x}{\underbrace{\ln(15-3x)}} \quad 15-3x=0 \quad x=5$$

$$\ln(1) = 0 \Rightarrow 15-3x = 1 \quad | +3x - 1$$

$$14 = 3x \quad | :3$$

$$x = 14/3 = 4 \frac{2}{3}$$



$$D = x \in \mathbb{R}^{<5} \setminus \{4 \frac{2}{3}\}$$

$$\lim_{x \rightarrow -\infty} h(x) = \left[ \frac{-\infty}{\infty} \right] = -\infty$$

$$(3x)' = 3$$

$$(\ln(15-3x))' = \frac{1}{15-3x} \cdot (-3) = \frac{1}{x-5}$$

$$\lim_{x \rightarrow 5^-} h(x) = \left[ \frac{15}{\ln(0)} \right] = 0^-$$

$$\lim_{x \rightarrow 4 \frac{2}{3}} h(x) = \left[ \frac{14}{\ln(1)} \right] = \infty$$

$$\Rightarrow W = y \in \mathbb{R}$$

S180

$$1) \quad 3x^2 - 18x + 24 = 3 \cdot (x^2 - 6x + 8) = 3 \cdot (x-4)(x-2) = 0$$

Satz v. Vieta :  $\mathcal{L} = \{2; 4\}$

$$2) \quad -0,5x^2 + 2x = -2,5 \quad | +2,5 \cdot (-2)$$
$$x^2 - 4x - 5 = 0 \quad p = -4 ; q = -5$$

p-q-Formel :  $x_{1/2} = -\frac{(-4)}{2} \pm \sqrt{\left(\frac{-4}{2}\right)^2 + 5} = 2 \pm \sqrt{9}$

$$x_1 = 5 \vee x_2 = -1 \quad ; \quad \mathcal{L} = \{-1; 5\}$$

$$3) \quad x \cdot (2x - 20) = -32 \quad | +32$$
$$2x^2 - 20x + 32 = 0 \cdot (x^2 - 10x + 16) = 0 \cdot [(x-5)^2 - 25 + 16] = 0 \quad | \cdot 1/2$$

QE:

$$(x-5)^2 - 9 = 0 \quad | +9 \quad \mathcal{L} = \{2; 8\}$$

$$(x-5)^2 = 9 \quad | \sqrt{\quad}$$

$$x-5 = \pm \sqrt{9} = \pm 3 \quad | +5 \quad x_1 = 8 \vee x_2 = 2$$



$$4) \quad f(x) = -x^2 + 2x + 3 = -(x^2 - 2x - 3) = -(x-3)(x+1)$$

Nach unten geöffnete Normalparabel  $S_{x_1}(3|0)$   $S_{x_2}(-1|0)$   
 $S_y(0|3)$

$$\text{Scheitelpunkt } S: (1 | f(1)) = (1 | 4) \hat{=} \text{HP}$$

Achsensymmetrie zu  $x=1$

$$5) \quad g(x) = \frac{1}{4}x^2 + 2x + 3 = \frac{1}{4} \cdot (x^2 + 8x + 12) = \frac{1}{4} \cdot (x+6)(x+2)$$

Nach oben geöffnet und um  $\frac{1}{4}$  gestreckte Parabel

$$S_{x_1}(-6|0) \quad S_{x_2}(-2|0) \quad S_y(0|3)$$

$$\text{Scheitelpunkt } S: (-4 | f(-4)) = (-4 | -1) \hat{=} \text{TP}$$

Achsensymmetrie zu  $x=-4$

$$6) \quad h(x) = 100 - 4x^2 = -4 \cdot (x^2 - 25) = -4 \cdot (x-5)(x+5)$$

→ Nach unten geöffnete um den Faktor 4 gestreckte Parabel

$S_{x_1}(5|0)$ ,  $S_{x_2}(-5|0)$ ;  $S_y(0|100)$  = Scheitelpunkt  $\hat{=}$  HP  
Achsensymmetrie zur y-Achse

$$7) \quad x^4 + 100 = 29x^2 \quad | -29x^2$$

$$x^4 - 29x^2 + 100 = (x^2 - 25)(x^2 - 4) = (x+5)(x-5)(x+2)(x-2)$$

$$\mathcal{L} = \{ \pm 2; \pm 5 \}$$

$$8) \quad x^6 = 7x^3 + 8 \quad | -7x^3 - 8 \quad \Leftrightarrow \quad x^6 - 7x^3 - 8 = 0 \quad z = x^3$$

$$z^2 - 7z - 8 = 0$$

$$z_{1/2} = \frac{7}{2} \pm \sqrt{\left(\frac{7}{2}\right)^2 + 8} = \frac{7}{2} \pm \sqrt{\frac{81}{4}} = \frac{7}{2} \pm \frac{9}{2} \quad \begin{matrix} z_1 = 8 \\ z_2 = -1 \end{matrix} \quad x = \sqrt[3]{z}$$

$$x_1 = \sqrt[3]{8} = 2 \quad \vee \quad x_2 = \sqrt[3]{-1} = -1 \quad \Rightarrow \quad \mathcal{L} = \{ -1; 2 \}$$