

Aufgabe 1:

$$a.) \sqrt[24]{x^3} / (x^3 (x^3)^2) = x^{(27-9-6)/24} = x^{12/24} = x^{1/2} = \sqrt{x}$$

$$b.) \frac{1}{x} + \frac{2x}{x-2} - \frac{5}{x+3} - \frac{20}{x^2+x-6} - \frac{3}{x^2+3x}$$

$$\Leftrightarrow \frac{1}{x} + \frac{2x}{x-2} - \frac{5}{x+3} - \frac{20}{(x+3)(x-2)} - \frac{3}{x(x+3)} \quad \text{gemeinsamer Nenner: } x(x-2)(x+3)$$

$$\Leftrightarrow \frac{(x-2)(x+3) + 2x^2(x+3) - 5(x-2)x - 20x - 3(x-2)}{x(x-2)(x+3)}$$

$$\Leftrightarrow \frac{1}{x(x-2)(x+3)} (x^2+x-6 + 2x^3 + 6x^2 - 5x^2 + 10x - 20x - 3x + 6)$$

$$\Leftrightarrow \frac{1}{x(x-2)(x+3)} (2x^3 - 12x + 2x^3)$$

$$2x(x^2+x-6) = 2x(x-2)(x+3)$$

$$\Leftrightarrow \underline{\underline{2}}$$

$$e.) \frac{\frac{a}{a-b} - \frac{b}{a+b}}{\frac{a}{a+b} + \frac{b}{a-b}} \Leftrightarrow \frac{\frac{a(a+b)}{(a-b)(a+b)} - \frac{b(a-b)}{(a+b)(a-b)}}{\frac{a(a-b)}{(a+b)(a-b)} + \frac{b(a+b)}{(a+b)(a-b)}} \quad \textcircled{1}$$

$$\frac{a(a+b) - b(a-b)}{(a-b)(a+b)} \quad \textcircled{2}$$

$$\Leftrightarrow \frac{a(a+b) - b(a-b)}{(a-b)(a+b)} \quad \textcircled{1}$$

$$\frac{a(a-b) + b(a+b)}{(a+b)(a-b)} \quad \textcircled{2}$$

$$\Leftrightarrow \frac{a(a+b) - b(a-b)}{(a^2 - b^2)}$$

$$\frac{a(a-b) + b(a+b)}{(a^2 - b^2)}$$

$$\Leftrightarrow \frac{a(a+b) - b(a-b)}{(a^2 - b^2)} \cdot \frac{(a^2 - b^2)}{a(a-b) + b(a+b)}$$

$$\Leftrightarrow \frac{a(a+b) - b(a-b)}{a(a-b) + b(a+b)}$$

$$\Leftrightarrow \frac{a^2+ab-ab+b^2}{a^2-ab+ab+b^2}$$

$$\Leftrightarrow \frac{a^2+b^2}{a^2+b^2} = \underline{\underline{1}}$$

$$d.) \ln \left(\sqrt{e^{3(\ln(e^2)+\ln(e^6))}} \right)$$

$$\Leftrightarrow \ln \left(\sqrt{e^{3(2\ln(e)+6\ln(e))}} \right)$$

$$\Leftrightarrow \ln \left(\sqrt{e^{3(2+6)}} \right) \Leftrightarrow \ln \left(\sqrt{e^{24}} \right) \Leftrightarrow \ln(e^{12}) \Leftrightarrow 12 \ln(e) \Leftrightarrow \underline{\underline{12}}$$

$$e.) \sqrt{x+16} - \sqrt{x-12} = 2 \quad D = \{x \in \mathbb{R} \mid x \geq -16 \wedge x \geq 12\} = [12; \infty)$$

$$\sqrt{x+16} = 2 + \sqrt{x-12}$$

$$\Leftrightarrow x+16 = 4 + 4\sqrt{x-12} + x-12$$

$$\Leftrightarrow 24 = 4\sqrt{x-12} \Rightarrow \sqrt{x-12} = 6 \Rightarrow x = 36 + 12 = 48$$

$$\underline{\underline{L = \{48\}}}$$

$$f.) 8x^2 - 14x = 9 \quad | :8 \quad | -9$$

$$x^2 - \frac{7}{4}x - \frac{9}{8} = 0$$

$$x = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

$$\Leftrightarrow x = \frac{7}{8} \pm \sqrt{\left(\frac{7}{8}\right)^2 + \frac{9}{8}}$$

$$\Leftrightarrow x = \frac{9}{4} \vee x = -\frac{1}{2} \quad L = \left\{-\frac{1}{2}; \frac{9}{4}\right\}$$

$$g.) x^4 - \frac{7}{4}x^2 - \frac{9}{8} = 0 \quad u = x^2 / \sqrt{\quad}$$

$$\Leftrightarrow u^2 - \frac{7}{4}u - \frac{9}{8} = 0 \quad x = \sqrt{u}$$

$$u = \frac{7}{8} \pm \sqrt{\frac{49}{64} + \frac{72}{64}}$$

$$u = \frac{9}{4} \vee u = -\frac{1}{2}$$

$$x = -\frac{3}{2} \vee x = \frac{3}{2} \Rightarrow L = \left\{-\frac{3}{2}; \frac{3}{2}\right\}$$

$$h.) \underline{|x+1|} + \underline{|x+2|} \leq 2$$

$$\text{Fall 1: } x+1 \geq 0 \Rightarrow x \geq -1$$

$$a.) x+2 \geq 0 \Rightarrow x \geq -2$$

$$x+1+x+2 \leq 2 \Rightarrow 2x \leq -1 \Rightarrow x \leq -\frac{1}{2}$$

$$x \geq -1 \wedge x \geq -2 \wedge x \leq -\frac{1}{2}$$

$$x \in [-1; -\frac{1}{2}]$$

$$b.) \quad x+2 \leq 0 \Rightarrow x \leq -2$$

$$x \in \{\}$$

$$\text{Fall 2: } x+1 \leq 0 \Rightarrow x \leq -1$$

$$a.) \quad x+2 \geq 0 \Rightarrow x \geq -2$$

$$-x-1+x+2 \leq 2$$

$$1 \leq 2$$

$$\Rightarrow x \in [-2; -1]$$

$$b.) \quad x+2 \leq 0 \Rightarrow x \leq -2$$

$$-x-1-x-2 \leq 2 \Rightarrow -2x \leq 5 \Rightarrow x \geq -\frac{5}{2}$$

$$\Rightarrow x \in [-\frac{5}{2}; -2]$$

$$\text{Zusammenfassen: } x \in [-1; -\frac{1}{2}] \cup [-2; -1] \cup [-\frac{5}{2}; -2]$$

$$\Rightarrow x \in [-\frac{5}{2}; -\frac{1}{2}]$$

$$e) \quad \frac{x+2}{x^2-x-2} < -1 \quad D = \mathbb{R} \setminus \{-1, 2\}$$

$$\rightarrow \text{Nullstellen: } x \in \{1, 2\}$$

Morgen genauer mit cooler Skizze!

Aufgabe 2:

$$\textcircled{1} \quad l = a+b \quad \textcircled{2} \quad \frac{l}{a} = \frac{a}{b} \quad \textcircled{3} \quad \underline{\Phi} = \frac{a}{b} \Rightarrow \frac{b}{a} = \frac{1}{\underline{\Phi}} = \underline{\Phi}^{-1}$$

$$\textcircled{1} \text{ im } \textcircled{2}: \quad \frac{l}{a} = \frac{a+b}{a} = \frac{a}{b}$$

$$\frac{a}{a} + \frac{b}{a}$$

$$\text{Einsetzen } \textcircled{3}: \quad 1 + \frac{1}{\underline{\Phi}} = \underline{\Phi} \quad | \cdot \underline{\Phi}$$

$$\Leftrightarrow \underline{\Phi} + 1 = \underline{\Phi}^2 \quad | -\underline{\Phi} | -1$$

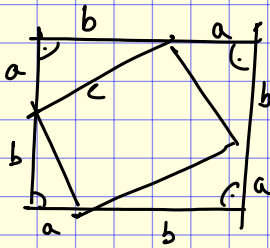
$$\Leftrightarrow \Phi^2 - \Phi - 1 = 0 \quad (= x^2 - x - 1 = 0)$$

$$\Phi = \frac{1}{2} \pm \sqrt{\frac{5}{4}}$$

$$\Phi = \frac{1 + \sqrt{5}}{2} = \frac{a}{b}$$

Aufgabe 3:

a.)



① Ages

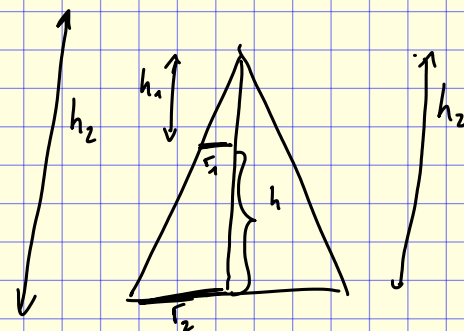
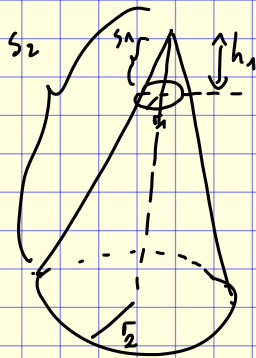
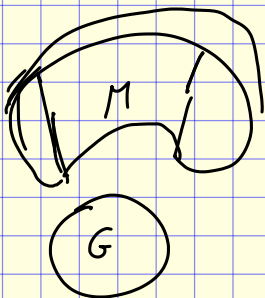
② Ages $\rightarrow \sum 4 \text{ Dreieck} + \text{Quadrat}$

$$(a+b)^2 = c^2 + \frac{ab}{2} \cdot 4$$

$$a^2 + 2ab + b^2 = c^2 + 2ab$$

$$a^2 + b^2 = c^2$$

b.)



Kongruenz: $\frac{h_2}{d_2} = \frac{h_1}{d_1}, h_2 = h_1 + h$

$$\frac{h + h_1}{d_2} = \frac{h_1}{d_1} \Rightarrow \frac{h}{d_2} = h_1 \left(\frac{1}{d_1} - \frac{1}{d_2} \right)$$

$$\Rightarrow h_1 = h \frac{d_1}{d_2 - d_1}$$

$$\Rightarrow h_2 = h \left(1 + \frac{d_1}{d_2 - d_1} \right) = h \cdot \left(\frac{d_2}{d_2 - d_1} \right)$$

Volumen: $\frac{1}{3} G h \Rightarrow \frac{\pi}{3} r_2^2 h_2 - \frac{\pi}{3} r_1^2 h_1$

$$V = \frac{h}{4} \frac{\pi}{3} [d_2^2 h_2 - d_1^2 h_1] = h \frac{\pi}{12} \left[\frac{d_2^3}{d_2 - d_1} - \frac{d_1^3}{d_2 - d_1} \right]$$

$$= h \frac{\pi}{12} \frac{d_2^3 - d_1^3}{d_2 - d_1} \approx 10,52 \text{ l}$$

Mantelfläche:

$$A_M = \frac{\alpha}{360} \cdot \pi s^2 \Rightarrow A_M = \pi r s$$

Hier: $s_1 = \sqrt{h_1^2 + r_1^2}$; $s_2 = \sqrt{h_2^2 + r_2^2}$

$$A_{M,1} = \pi s_1 r_1 = \pi \sqrt{h_1^2 + r_1^2} \approx 1.717,42 \text{ cm}^2$$

$$A_{M,2} = \pi s_2 r_2 = \pi \sqrt{h_2^2 + r_2^2} \approx 3.714,14 \text{ cm}^2$$

$$\Rightarrow A_M = A_{M,2} - A_{M,1} \approx 1.996,72 \text{ cm}^2 = 0,199672 \text{ m}^2$$

Materialverbrauch:

$$A_M + \pi \frac{d_1^2}{4} = 19,567 \text{ dm}^2 + 2,2698 \text{ dm}^2 \approx 22,237 \text{ dm}^2$$

c.) a.) $r=1$; $\varphi=0$; $h=0$

b.) $r=\sqrt{2}$; $\varphi=\frac{\pi}{4}$; $h=0$

c.) $r=\sqrt{2}$; $\varphi=\frac{\pi}{4}$; $h=1$

d.) $r=\sqrt{3}$; $\varphi=54,74^\circ$; $h=0$

e.) $r=\sqrt{13}$; $\varphi=56,31^\circ$; $h=4$

f.) $r=0$; $\varphi=0$; $h=0$

Aufgabe 4:

a.) $F=ma$ $[F]=1\text{N}=1\text{kg}\cdot\frac{\text{m}}{\text{s}^2}$

b.) $W=F\cdot s$; $E_{\text{kin}}=\frac{1}{2}mv^2$; $E_{\text{pot}}=mgh$

$$[W]=[E]=1\text{kg}\cdot 1\frac{\text{m}^2}{\text{s}^2}$$

c.) $[E]=1\frac{\text{A}\cdot\text{s}}{\frac{\text{A}\cdot\text{s}}{\text{Vm}}}\cdot 1\frac{\text{m}}{\text{m}^3}=\frac{\text{V}}{\text{m}}$

d.) gerne auf Anfrage

Aufgabe 5: untersch. Steigungen

