Aufgabe 1: $(a+\frac{1}{2}\sqrt{x})^8 = \sum_{k=0}^{n}\binom{8}{k}x^{n-k}y^k$ // Taschenrechner 8 $\underline{\underline{nCr}}$ $1 = 8$

$$\underline{\underline{a^8+8a^7\,\frac{1}{2}\sqrt{x}+28\,a^6\left(\frac{1}{2}\sqrt{x}\right)^2\ldots}}$$

Aufgabe 2: $L = \{x \in \mathbb{R} : (x-1)\cdot(x+3) = -4\}$

$$(x-1)\cdot(x+3) = -4$$

$$x^2+3x-x-3 = -4$$

$$x^2+2x-3 = -4 \quad |+4$$

$$x^2+2x+1 = 0$$

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

$$= -1 \pm \sqrt{0} = \begin{matrix} x_1 = -1 \\ x_2 = -1 \end{matrix} \Rightarrow L = \{-1\}$$

Aufgabe 3: $z_1 = 1+\sqrt{3}i \qquad z_2 = -\sqrt{3}+i$

$$|z_1| = \sqrt{x^2+y^2} = \sqrt{1^2+\sqrt{3}^2} = 2$$

$$\varphi_1 = \arctan\left(\frac{y}{x}\right) = \arctan\left(\frac{\sqrt{3}}{1}\right) = \frac{\pi}{3} \qquad r^n(n\cdot\varphi)$$

$$\underline{\underline{z_1 = 2e^{\frac{\pi}{3}i}}}$$

$$|z_2| = \sqrt{(-\sqrt{3})^2+1^2} = 2$$

$$\varphi_2 = \arctan\left(\frac{y}{x}\right)+\pi = \arctan\left(\frac{1}{-\sqrt{3}}\right)+\pi = \frac{5}{6}\pi$$

$$z_2 = 2e^{\frac{5}{6}\pi i}$$

$$\frac{z_1}{z_2} = \underline{\underline{e^{-\frac{\pi}{2}i}}} \Rightarrow \begin{matrix} x = r\cdot\cos(\varphi) = 0 \\ y = r\cdot\sin(\varphi) = -1 \end{matrix} \Rightarrow \underline{\underline{-i}}$$

$$z_2^6 = \underline{\underline{64e^{-3\pi i}}} \Rightarrow \begin{matrix} x = -1 \\ y = 0 \end{matrix} \Rightarrow \underline{\underline{-1}}$$

Aufgabe 4: $y = 5 + 2\ln(x^2 - 1),\ x > 1$

$$y - 5 = 2\ln(x^2 - 1),\ x > 1$$
$$\frac{y-5}{2} = \ln(x^2 - 1),\ x > 1$$
$$x^2 - 1 = e^{\frac{y-5}{2}} \quad |+1$$
$$x^2 = e^{\frac{y-5}{2}} + 1 \quad |\sqrt{\ }$$
$$x = \sqrt{e^{\frac{y-5}{2}} + 1}$$
$$f^{-1}(x) = y^{-1} = \sqrt{e^{\frac{x-5}{2}} + 1}$$

$D = \mathbb{R}$
$W = \mathbb{R} > 0$

Aufgabe 5: $y_1(t) = 2\cos\left(3t + \frac{\pi}{4}\right) = 2\sin\left(3t + \frac{3}{4}\pi\right)$

$$y_2(t) = 3\sin\left(3t - \frac{\pi}{2}\right)$$

$\underline{A_1} = 2e^{\frac{3}{4}\pi i}$; $\underline{A_2} = 3e^{-\frac{\pi}{2}i}$

$$\underline{A_1} = 2\left(\cos\left(\frac{3}{4}\pi\right) + i\sin\left(\frac{3}{4}\pi\right)\right) = 2\left(-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}\right) = -\sqrt{2} + \sqrt{2}i$$
$$\underline{A_2} = 3\left(\cos\left(-\frac{\pi}{2}\right) + i\sin\left(-\frac{\pi}{2}\right)\right) = 3(0 - 1i) = -3i$$

$$\underline{A} = \underline{A_1} + \underline{A_2} = -\sqrt{2} - 3\sqrt{2}i$$
$$A = \sqrt{x^2 + y^2} = \sqrt{(-\sqrt{2})^2 + (-3\sqrt{2})^2} = 4$$
$$\varphi = \arctan\left(\frac{y}{x}\right) - \pi = \arctan\left(\frac{-3\sqrt{2}}{-\sqrt{2}}\right) - \pi \approx 1{,}89$$

$$\underline{\underline{4e^{3t + 1{,}89i}}}$$

Aufgabe 6: $\vec{a} = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix},\ \vec{b} = \begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix}$ ges: A, $\vec{a}$ & $\vec{b}$ kollinear?

$$A = |\vec{a} \times \vec{b}| = \left|\begin{pmatrix} 0\cdot(-1) - 1\cdot 1 \\ 1\cdot 3 + 1\cdot(-1) \\ -1\cdot 1 - 0\cdot -1 \end{pmatrix}\right| = \left|\underbrace{\begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix}}_{\neq \vec{0}\ \Rightarrow\ \text{nicht kollinear}}\right| = \sqrt{(-1)^2 + 2^2 + (-1)^2} = \sqrt{6}$$