1) $\{1;2\}$ -> Menge mit der Zahl 1, 2

2) $(1;2)$ -> Punkt mit $x = 1$ und $y = 2$

$(1;2) = \{\}$ -> $]1;2[_{\mathbb{R}}$

$[3;5]_{\mathbb{R}} = \{x \in \mathbb{R} \mid x \geq 3 \land x \leq 5\}$

$]3;5[_{\mathbb{R}} = (3,5)_{\mathbb{R}} = \{\underbrace{x \in \mathbb{R}}_{\text{WELT}} \mid \underbrace{x > 3 \land x < 5}_{\text{BEDINGUNG}}\}$

$[3;5)$

1) $\{x \in \mathbb{Z} \mid x \bmod 3 = 0\}$

2) $\{x \in \mathbb{Z} \mid x \bmod 4 = 0 \ \lor \ x \bmod 5 = 0\}$

3) $\{x \in \mathbb{Z} \mid x \bmod 3 <> 0\}$

4) $\{x \in]4;42[\mid x \bmod 6 <> 0\}$

$x \bmod 2 <> 0 \ \land \ x \bmod 3 <> 0$

5) $\{x \in \mathbb{Z} \mid x > 42 \ \land \ x \bmod 7 = 0 \ \land \ x \bmod 3 <> 0\}$

$\{ x \in \mathbb{N}^{>42} \mid$ -"- $\}$

$\mathbb{N}$

$\subset$

$\mathbb{Z}$

$\subset$

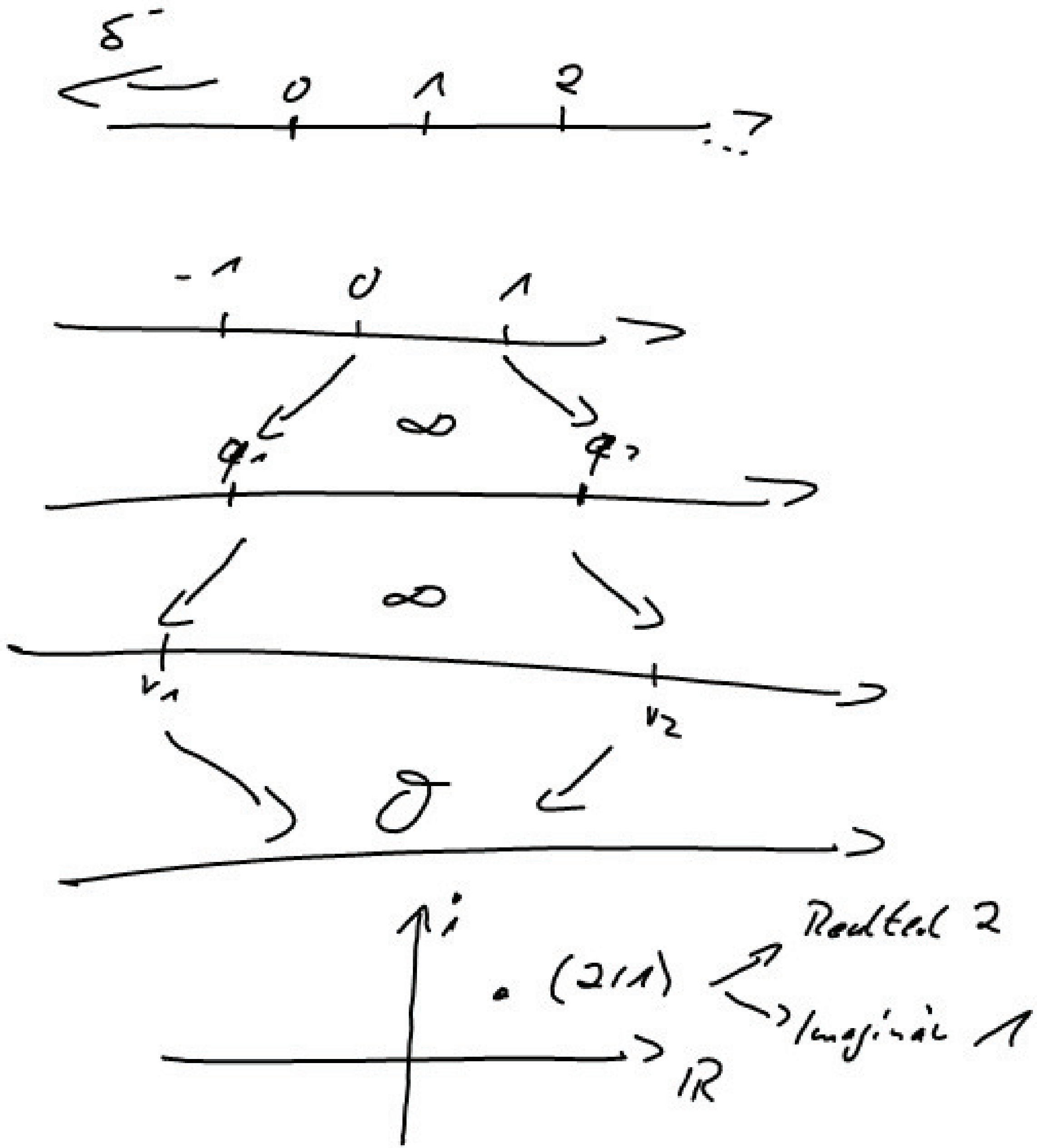
$\mathbb{Q}$ $\quad \frac{a}{b}$

$\subset$

$\mathbb{R}$ $\to e$, $\to \pi$, $\to \sqrt{2}$

$\subset$

$\mathbb{C} \to i = \sqrt{-1}$



$$\overline{3 + 5} = \bar{3} - \bar{5} = 10 - 2 = 8$$

$$\bar{8}$$

$(a+b)^4$

$$
\begin{array}{ccccccccccccc}
 & & & & & 1 & & & & & & & 0 \\
 & & & & 1 & & 1 & & & & & & 1 \\
 & & & 1 & & 2 & & 1 & & & & & 2 \\
 & & 1 & & 3 & & 3 & & 1 & & & & 3 \\
 & 1 & & 4 & & 6 & & 4 & & 1 & & \leftarrow & 4 \\
1 & & 5 & & 10 & & 10 & & 5 & & 1 & & 5
\end{array}
$$

$(2i-1)^4$

$(2i-1)^2 \cdot (2i-1)^2$

1. Koeffizienten $1(2i)^4(-1)^0 + 4(2i)^3(-1)^1 + 6(2i)^2(-1)^2 + 4(2i)^1(-1)^3 + 1(2i)^0(-1)^4$

2. Linke Variable $16 + 32i - 24 - 8i + 1$

3. rechte Variable $-7 + 24i$

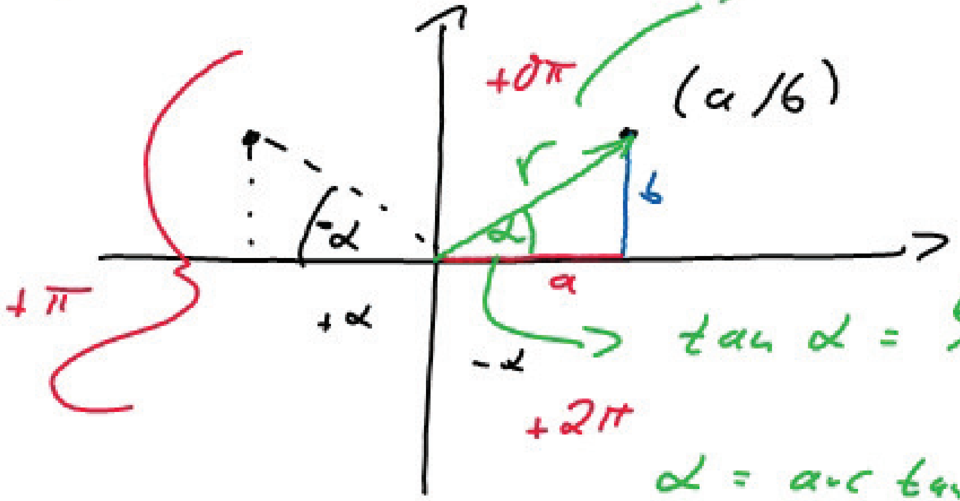
$$\left(\tfrac{1}{2}i - 4\right)^4$$

$$1\left(\tfrac{1}{2}i\right)^4(-4)^0 + 4\left(\tfrac{1}{2}i\right)^3(-4)^1 + 6\left(\tfrac{1}{2}i\right)^2(-4)^2 + 4\left(\tfrac{1}{2}i\right)^1(-4)^3 + 1\left(\tfrac{1}{2}i\right)^0(-4)^4$$

$$1/16 + 2i - 24 - 128i + 256$$

$$232\tfrac{1}{16} - 126i$$

$$r = \sqrt{a^2 + b^2}$$



$$\tan\alpha = b/a$$

$$\alpha = \arctan(b/a)$$

$$(\sqrt{x}+3)^2 = x + 6\sqrt{x} + 9$$

$$(a+b)(a-b) = a^2 - b^2$$

$$(\sqrt{x}+3)(\sqrt{x}-3) = x - 9$$

$$\frac{2i-4}{3i+1} \cdot \frac{3i-1}{3i-1} = \frac{(2i-4)(3i-1)}{(3i+1)(3i-1)}$$

$$= \frac{6i^2 - 12i - 2i + 4}{9i^2 - 1}$$

$$= \frac{-2-14i}{-10} = 0{,}2 + 1{,}4i$$

1) $z = 15i + (0{,}5 + 2i)^4 - \frac{1}{16}$

2) $z = \frac{2i+3}{3+i} - \frac{i+4}{2i+1} + 0{,}3 \cdot (i-3)$

$z = a + bi$
Argument
Betrag
?

3) $z^2 - (6i-4) \cdot z = 12i + 9$

1) $1\left(\frac{1}{2}\right)^4 (2i)^0 + 4\left(\frac{1}{2}\right)^3 (2i)^1 + 6\left(\frac{1}{2}\right)^2 (2i)^2 + 4\left(\frac{1}{2}\right)^1 (2i)^3 + 1\left(\frac{1}{2}\right)^0 (2i)^4$

$15i + \left(1/16 \quad + \quad i \quad - \quad 6 \quad - 16i \quad + 16\right) - 1/16$

$15i \quad (\; -15i + 1/16 \quad + 10) \; - 1/16$

$z = 10 \qquad r = 10 \qquad \alpha = 0^\circ$

2)

$$\frac{2i+3}{3+i}\cdot\frac{3-i}{3-i} = \frac{6i-2i^2+9-3i}{3^2-i^2} = \frac{3i+11}{10}$$

$$\frac{i+4}{2i+1}\cdot\frac{2i-1}{2i-1} = \frac{2i^2-i+8i-4}{4i^2-1} = \frac{-6+7i}{-5}$$

$$0{,}3\cdot(i-3) = \frac{3i-9}{10}$$

$$\hookrightarrow \quad \frac{3i+11-12+14i+3i-9}{10}$$

$$\frac{-10+20i}{10} = -1+2i$$

$$r = \sqrt{5} \quad ; \quad \alpha = \arctan(-2)+\pi$$

3) $z^2 - (6i-4)\cdot z = 12i+9$

$z^2 - \underbrace{(6i-4)}_{p}\cdot z - \underbrace{(12i+9)}_{q} = 0$ Nullform

$x^2 + p\cdot x + q = 0 \qquad x_{1/2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$

$z_{1/2} = \frac{6i-4}{2} \pm \sqrt{\left(\frac{6i-4}{2}\right)^2 + 12i + 9}$

$= 3i-2 \pm \sqrt{(9i^2 - 12i + 4) + 12i + 9}$

$= 3i-2 \pm \sqrt{4} \longrightarrow z_1 = 3i$ $\quad r = 3$, $\alpha = 90°$

$z_2 = 3i-4 \longrightarrow r = 5$

$\alpha = \arctan\left(-\frac{3}{4}\right) + \pi$

$$\to M = \{\pm 1; \pm 2; \pm 3; \pm 6\}$$

$$x^3 - 2x^2 - 5x + 6 = 0$$

$$x = 1 \Rightarrow 1^3 - 2\cdot 1^2 - 5\cdot 1 + 6 = 0 \qquad (x-1)$$

$$
\begin{array}{l}
(x^3 - 2x^2 - 5x + 6) : (x-1) = \underbrace{x^2 - x - 6}_{(x-3)(x+2)} \\
-(x^3 - x^2) \\
\hline
/ \quad -x^2 - 5x + 6 \\
\quad -(-x^2 + x) \\
\hline
\quad / \quad -6x + 6 \\
\qquad -(-6x + 6) \\
\hline
\qquad - \quad -
\end{array}
$$

Satz von Vieta

$$x^2 + p\cdot x + q = (x+a)(x+b)$$

$$a + b = p \wedge a\cdot b = q$$

$$x^2 + 6x + 8 = (x+4)\cdot(x+2) \to x_1 = -2$$

$$x_2 = -4$$

3) $2x^3 - 22x = 8x^2 - 60 \qquad | -8x^2 + 60$

$2x^3 - 8x^2 - 22x + 60 = 0 \qquad | : 2$

$x^3 - 4x^2 - 11x + 30 = 0 \qquad x_1 = 2$

$(x^3 - 4x^2 - 11x + 30) : (x - 2) = \underbrace{x^2 - 2x - 15}_{(x-5)(x+3)}$

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

$\quad / \quad -2x^2 - 11x + 30$

$\quad -(-2x^2 + 4x)$

$\quad\quad / \quad -15x + 30$

$\quad\quad -(-15x + 30)$

$\quad\quad\quad / \quad /$

$\mathbb{L} = \{-3; 2; 5\}$

$$\frac{\frac{a}{3}+2+\frac{3}{a}}{\frac{1}{6}+\frac{1}{2a}} = \frac{\frac{\overbrace{a^2+6a+9}^{(a+3)^2}}{3a}}{\frac{a+3}{6a}}$$

$$= \frac{(a+3)^2}{3a} \cdot \frac{6a}{a+3} = (a+3)\cdot 2 = \underline{\underline{2a+6}}$$

1) $\sqrt{x^3 \cdot \sqrt[4]{x^6 \cdot \sqrt[3]{x^2}}} = \left(x^3\left(x^6\left(x^2\right)^{1/3}\right)^{1/4}\right)^{1/2}$

$= x^{3/2} \cdot x^{3/4} \cdot x^{1/12}$

$= x^{3/2 + 3/4 + 1/12}$

$= x^{\frac{18+9+1}{12}} = x^{28/12} = x^{7/3}$

$\rightarrow \sqrt[3]{x^7}$

2) $$\frac{(2^3 u^2 v^{-2} w)^4 \; (2^4 u^3 v^{-4} w^{-2})^{-3}}{(3^4 r^{-3} s^{-2} t^3)^2 \; (3^4 r^{-3} s^4 t^3)^{-2}}$$

$$\frac{2^{12} u^8 v^{-8} w^4 \; 2^{-12} u^{-9} v^{12} w^6}{3^8 r^{-6} s^{-4} t^6 \; 3^{-8} r^6 s^{-8} t^{-6}}$$

$$\frac{2^{12} 3^8 \; u^8 w^4 v^{12} w^6 r^6 s^4 s^8 t^6}{2^{12} 3^8 \; v^8 u^9 t^6 r^6}$$

$$\frac{w^{10} v^4 s^{12}}{u}$$

3) $\dfrac{\sqrt[k]{a^{2-k}}}{\left(\sqrt[k]{a}\right)^{3k+4}} \cdot \left(\dfrac{\left(\sqrt[k]{a^2}\right)^{k+3}}{\sqrt[k]{4}}\right)^2$

$$\frac{a^{\frac{2-k}{k}}}{a^{\frac{3k+4}{k}}} \cdot \frac{a^{\frac{2}{k}\cdot(2k+6)}}{a^{2/k}}$$

$$a^{\frac{2-k}{k} - \frac{3k+4}{k} + \frac{4k+12}{k} - \frac{2}{k}}$$

$$a^{\frac{2-k-3k-4+4k+12-2}{k}} = a^{8/k} = \sqrt[k]{a^8}$$