$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\frac{a^n}{a^m} = a^{n-m}$$

$$a^n \cdot a^m = a^{n+m}$$

$$\left(a^n\right)^m = a^{n \cdot m}$$

$$\frac{x^5 y^6 z^7}{a^3 b^4} : \frac{x^7 y^6 z^5}{a^4 b^3} = \frac{\overset{1}{\cancel{x^5}} \cdot \overset{1}{\cancel{y^6}} \cdot \overset{z^1}{\cancel{z^7}}}{\underset{1}{\cancel{a^3}}\, \underset{b^1}{\cancel{b^4}}} \cdot \frac{\overset{a^1}{\cancel{a^4}} \cdot \overset{1}{\cancel{b^3}}}{\underset{x^2}{\cancel{x^7}} \cdot \underset{1}{\cancel{y^6}} \cdot \underset{1}{\cancel{z^5}}}$$

Dividend Divisor

$$\frac{a^4}{a^3} = a^{4-3} = a$$

$$= \frac{a \cdot z}{b \cdot x^2}$$

$$\frac{(lh)^7}{(lh)^3} = lh^4$$

$$\frac{(Wo+lh)^7}{(Wo+lh)^3} = (Wo+lh)^4$$

$$\frac{Wo^2 - lh^2}{Wo - lh} = \frac{(Wo-lh)(Wo+lh)}{Wo-lh}$$

$$= Wo + lh$$

$$= \text{Dreamteam}$$

Zur Übung 6a
Aufgabe 1.5

$$(a-b)^3 = (a-b)^2 \cdot (a-b)$$

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

$$= a^3 \underline{- a^2b - 2a^2b} + 2ab^2 + ab^2 - b^3$$

$$= a^3 - 3a^2b + 3ab^2 - b^3$$

$$\neq a^3 - 2a^2b + 2ab^2 - b^3$$

richtig, aber nicht zielführend

$$(a^3 - 2a^2b) + 2ab^2 - b^3$$

Idee: Ausklammern!!

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

Kein gemeinsamer Faktor

$a^6 - b^6$ also der Zähler

$= (a^3 + b^3)(a^3 - b^3)$

$= (a^3 + b^3)\boxed{(a-b)(a^2+ab+b^2)}$

$= \boxed{a^3 + \cancel{a^2b} + \cancel{ab^2} - \cancel{ba^2} - \cancel{ab^2} - b^3}$

Nebenrechnung

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

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

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

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

$$a^3 - 2a^2b + 2ab^2 - b^3$$

$$= a^3 - b^3 - 2a^2b + 2ab^2$$

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

$$= (a-b)\,(a^2 + ab + b^2 - 2ab)$$

$$= (a-b)\,(a^2 - ab + b^2)$$

also der

Nenner

Zusammenfassen:

$$\frac{(a^3+b^3)\cdot\cancelto{1}{(a-b)}\cdot(a^2+ab+b^2)}{\cancelto{1}{(a-b)}\cdot(a^2-ab+b^2)} = \frac{(a^3+b^3)\cdot(a^2+ab+b^2)}{a^2-ab+b^2}$$

$$= \frac{(a+b)\cdot\cancelto{1}{(a^2-ab+b^2)}\cdot(a^2+ab+b^2)}{\cancelto{1}{a^2-ab+b^2}}$$

$$=(a+b)\cdot(a^2+ab+b^2) = a^3+a^2b+ab^2+a^2b+ab^2+b^3$$

$$=\underline{\underline{a^3+2a^2b+2ab^2+b^3}}$$

ganz ohne Polynomdivision

$$a^n \cdot b^n = (a \cdot b)^n$$

1.1 $$\left(\frac{2x}{3y}\right)^n \cdot \left(\frac{9y}{10x}\right)^n = \left(\frac{\overset{1}{\cancel{2}}\,\overset{1}{\cancel{x}}\,\overset{3}{\cancel{9}}\,\overset{1}{\cancel{y}}}{\underset{1}{\cancel{3}}\,\underset{1}{\cancel{y}}\,\underset{5}{\cancel{10}}\,\underset{1}{\cancel{x}}}\right)^n = \left(\frac{3}{5}\right)^n$$

1.2 $$\left(\frac{x-y}{a+b}\right)^2 \cdot \left(\frac{a^2-b^2}{x^2-y^2}\right)^2 = \left(\frac{\cancel{(x-y)}}{\cancel{(a+b)}} \cdot \frac{(a-b)\cancel{(a+b)}}{\cancel{(x-y)}(x+y)}\right)^2 = \left(\frac{a-b}{x+y}\right)^2$$

1.3 $\dfrac{a^2b^2(x-y)^4}{(a^2+b^2)(y-x)^2} = \dfrac{a^2b^2(x-y)^4}{(a^2+b^2)(x-y)^2} = \dfrac{a^2b^2(x-y)^2}{a^2+b^2} = \dfrac{(ab(x-y))^2}{a^2+b^2}$

1.4 $\dfrac{(a-1)^4(x-1)^3}{(a-1)^3(1-x)^2} = \dfrac{(a-1)^1\cdot(-1)(1-x)^3}{(1-x)^2} = (a-1)\cdot(-1)(1-x)$

$= (a-1)(x-1)$ //

$(x-1)^2$ } nur bei geradem Exponenten

1.5 fertig ☺

Ist auch schön ☺

$$\frac{\cancel{r^4} s^6 t^2}{r s^{-1}} \cdot \frac{r^{-1} s}{\cancel{r^4} s^4} \quad \frac{s^2 t^2 s^2}{r^2}$$

1.6 $$\frac{(r^2 s^3 t)^2}{r s^{-1}} : \frac{(r^2 s^2)^2}{r^{-1} s} = \frac{(r^2 s^3 t)^2}{r s^{-1}} \cdot \frac{r^{-1} s}{(r^2 s^2)^2} = \left(\frac{\cancel{r^2} \overset{s}{\cancel{s^3}} t}{\cancel{r^2} \cancel{s^2}}\right)^2 \cdot \frac{r^{-1} s^1}{r^1 s^{-1}} \cdot$$

Dividend $\quad$ $\underbrace{\text{Divisor}}_{\text{Kehrwert!}}$

$$\frac{s^2 t^2 \cdot s^2}{r^2} = \frac{s^4 t^2}{r^2}$$

N.R. $$\frac{r^{-1}}{r^1} = r^{-1-1} = r^{-2} = \frac{1}{r^2}$$

$$\frac{s^1}{s^{-1}} = s^{1-(-1)} = s^2$$

$$\boxed{\left(\frac{s^2 \cdot t}{r}\right)^2}$$ besser

$$(a^6 - b^6) : (a^3 - 2a^2b + 2ab^2 - b^3) = a^3 + 2a^2b + 2ab^2 + b^3$$

$$-(a^6 - 2a^5b + 2a^4b^2 - a^3b^3)$$

$$+2a^5b - 2a^4b^2 + a^3b^3 - b^6$$

$$-(2a^5b - 4a^4b^2 + 4a^3b^3 - 2a^2b^4)$$

$$2a^4b^2 - 3a^3b^3 + 2a^2b^4 - b^6$$

$$-(2a^4b^2 - 4a^3b^3 + 4a^2b^4 - 2ab^5)$$

$$a^3b^3 - 2a^2b^4 + 2ab^5 - b^6$$

$$-(a^3b^3 - 2a^2b^4 + 2ab^5 - b^6)$$

$$0$$

Aufgabe 1.5 gelöst mit Polynomdivision

2.1)

$$\frac{1}{x^6} + \frac{1 \cdot x^2}{x^4 \cdot x^2} + \frac{1 \cdot x^5}{x^1 \cdot x^5} = \qquad \text{HN } x^6$$

$$\frac{1 + x^2 + x^5}{x^6}$$

2.2)

$$\frac{1 \cdot x^1}{x^3 \cdot x^1} - \frac{x-1}{x^4} = \frac{x - (x-1)}{x^4} = \frac{x - x + 1}{x^4} = \frac{1}{x^4}$$

2.3

$$\frac{n^2(n^2+1)}{1(n^2+1)} + \frac{n(n^2+1)}{1(n^2+1)} + \frac{n^3-n}{n^2+1} = \frac{n^4+m^2+m^3\cancel{+n}+n^3\cancel{-m}}{m^2+1} = \frac{n^4+2n^3+n^2}{m^2+1}$$

$$\frac{\left[m\cdot(n+1)\right]^2}{m^2+1} = \frac{n^{2}(n+1)^{2}}{n^2+1} = \frac{m^2(n^2+2n+1)}{m^2+1}$$

2.4

$$\frac{x^3\cdot x^2}{4} + \frac{7x\cdot x^4}{4} = \frac{x^5}{4} + \frac{7x^5}{4} = \frac{8\cdot x^5}{4} = 2x^5$$

$$n^2 + n + \frac{n^3 - n}{n^2+1}$$

$$= \frac{n^2(n^2+1) + n(n^2+1) + n^3 - n}{n^2+1}$$

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

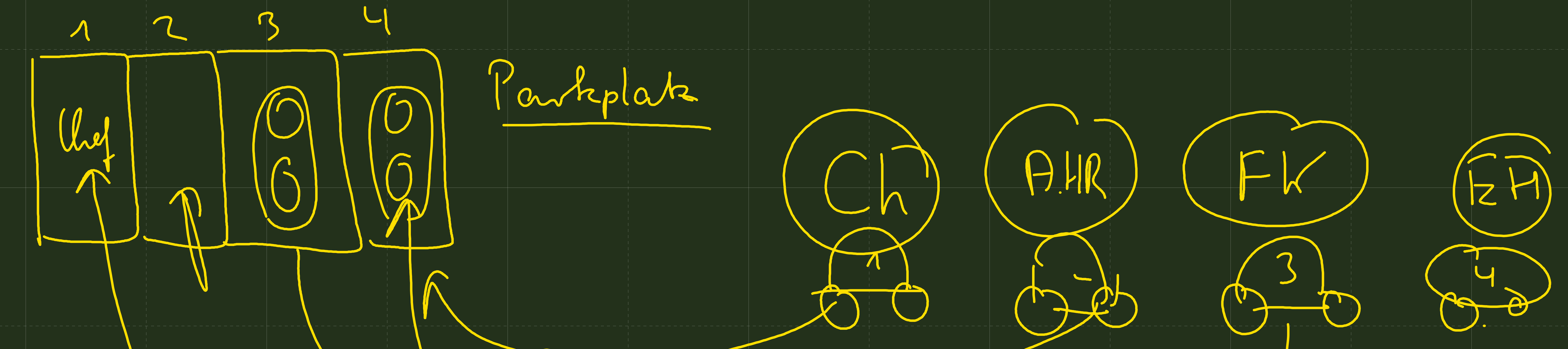
alternativer Ansatz
zu 2.3 leider
nicht zielführend

$n!$ lies: „n Fakultät“

$(-4)!$

nicht berechbar

$$n! = n \cdot (n-1)(n-2) \cdot \ldots \cdot 1$$



$$4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$$

$$\binom{n}{k} = \frac{n!}{k!(n-k)!} = \frac{n \cdot (n-1) \cdot (n-2)(n-3) \cdots \overset{(n-k+1)}{\vee} \cancel{(n-k)(n-k-1) \cdot (n-k-2) \cdot 1}}{k! \; \cancel{(n-k)} \cdot \cancel{(n-k-1)}(n-k-2) \cdots 1}$$

$$\frac{49!}{6!(49-6)!} = \frac{49 \cdot 48 \cdot 47 \cdot 46 \cdot 45 \cdot 44 \cdot \cancel{43} \cdot \cancel{42} \cdot \cancel{41} \cdot \cancel{40} \cdot \cancel{39} \cdot \cancel{38} \cdots \cancel{1}}{6! \quad \cancel{43} \cdot \cancel{42} \cdot \cancel{41} \cdot \cancel{40} \cdots \cancel{1}}$$

$49 \; \boxed{nCr} \; 6 = 13983816$

139838160 Möglichk