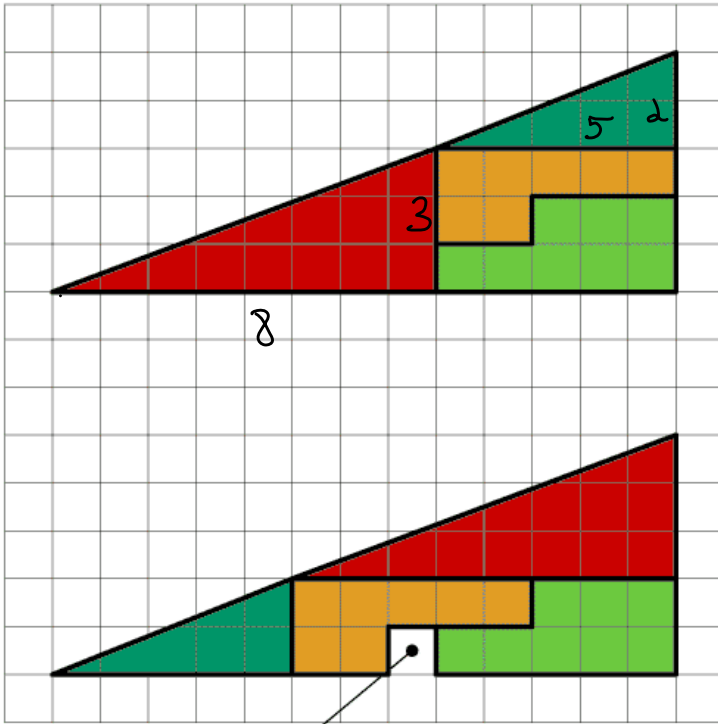


Gleichungen + Funktionen

Denksport

HOW CAN THIS BE TRUE ?

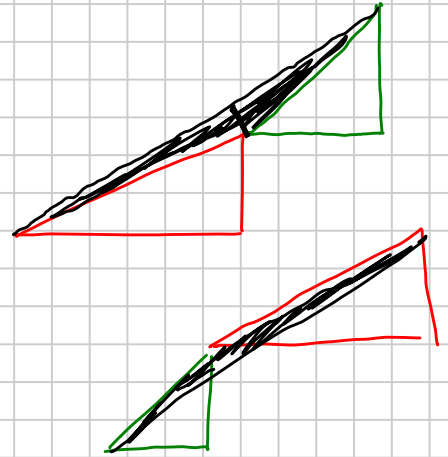


Below the four parts are moved around

The partitions are exactly the same, as those used above

$$\frac{3}{8} \neq \frac{2}{5}$$

$$\frac{15}{40} \neq \frac{16}{40}$$



WH

$$(5ab + 2c - 3ba)^3$$

$$(2ab + 2c)^3 =$$

$$= (2ab)^3 + (2ab)^2 \cdot 2c + (2ab) \cdot (2c)^2 + (2c)^3 =$$

$$= 8a^3b^3 + 3 \cdot 4a^2b^2 \cdot 2c + 3 \cdot 2ab \cdot 4c^2 + 8c^3 =$$

$$= 8a^3b^3 + 24a^2b^2c + 24abc^2 + 8c^3$$

$$(\dots) \cdot (\dots) \cdot (\dots)$$

$$(\dots) \cdot (\dots)$$

Bsp. Handy

$$1.) \quad 5 \text{ € GG} \quad + \quad 0,01 \text{ €/min}$$

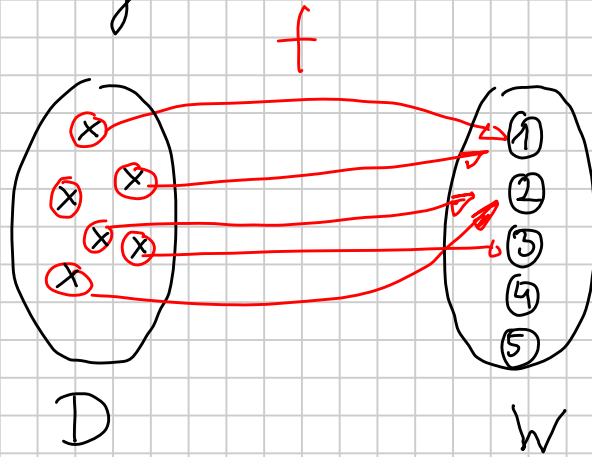
$$2.) \quad 0,05 \text{ €/min}$$

$$K_1(x) = 5 + 0,01 \cdot x$$

$$K_2(x) = 0,05 \cdot x$$

Funktion

= Zuordnung

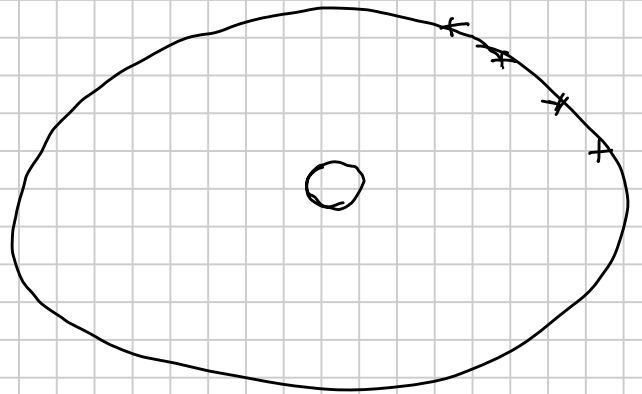
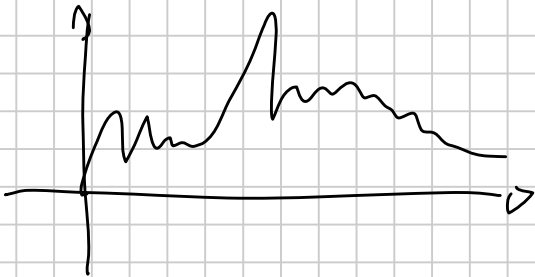


x	\rightarrow	$y = f(x)$
1	\rightarrow	1
2	\rightarrow	4
3	\rightarrow	9
4	\rightarrow	16

$$f(x) = x^2$$

„f von x“

Zeitpunkt	8	9	10	11	...	17	18
Temp	-1°	2°	4°	5°		2°	-1°

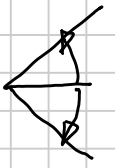


Lineare Fkt

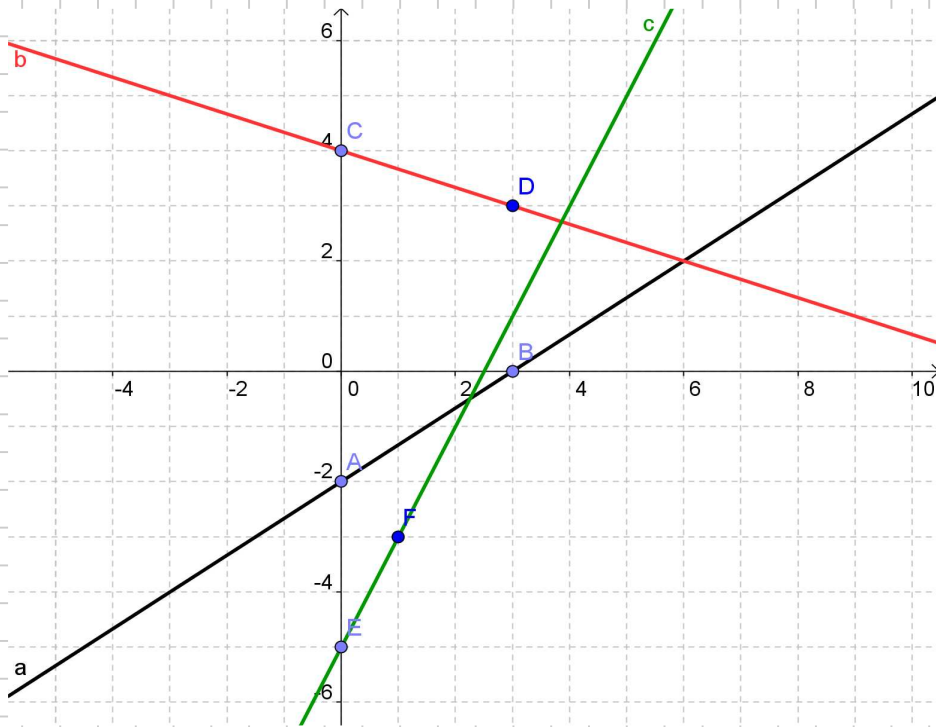
$$f(x) = y = k \cdot x + d$$

k ... Steigung (konstant)

d ... Ordinatenabschnitt



S 2/61



$$\begin{aligned} y &= \frac{2}{3}x - 2 \\ y &= -\frac{1}{3}x + 4 \\ y &= 2x - 5 \end{aligned}$$

• $f(x) = y = 2x - 5$ schneidet x-Achse

∩

$$0 = 2x - 5 \quad | +5$$

$$5 = 2x \quad | :2$$

$$2,5 = x$$

⇒ Nullstelle $x = 2,5$

$N(2,5 | 0)$

• Bsp. Handy - Wertkarte 10€

7 Cent/min

$$f(x) = y = 10 - 0,07 \cdot x$$

x ... Minute

$$0 = 10 - 0,07x \quad | +0,07x$$

y ... Guthaben

$$0,07x = 10 \quad | :0,07$$

$$\underline{x = 142,85}$$

A: Ich kann mit 10 € ≈ 143 min telefonieren.

• Handy - Tarif - Vergleich

$$K_1(x) = 0,01 \cdot x + 5$$

$$K_2(x) = 0,05 \cdot x$$

$$K_1(x) = K_2(x)$$

$$0,01x + 5 = 0,05x \quad | -0,01x$$

$$5 = 0,04x \quad | : 0,04$$

$$125 = x$$

Bei 125 min kosten beide Tarife gleich viel.

$$K_1(125) = 0,01 \cdot 125 + 5 = 6,25$$

$$K_2(125) = 0,05 \cdot 125 = 6,25$$

[S(125/6,25)]

• Bsp Tarifermittlung

$$100 \text{ min} \Rightarrow 8 \text{ €}$$

$$300 \text{ min} \Rightarrow 12 \text{ €}$$

$$\text{Differenz } 200 \text{ min} \quad 4 \text{ €}$$

Δ Delta

$$1 \text{ min: } \frac{4}{200} = 0,02 \text{ €}$$

2 cent / min

$$\Rightarrow GG = 8 \text{ €} - 100 \cdot 0,02 = 6 \text{ €}$$

$$k = \frac{\Delta y}{\Delta x}$$

Differenzenquotient

$$k = \frac{12 - 8}{300 - 100} = \frac{4}{200} = \underline{0,02}$$

$$\frac{8 - 12}{100 - 300} = \frac{-4}{-200}$$

$$P(100 | 8)$$

$$\begin{cases} f(x) = y = k \cdot x + d \\ 8 = 0,02 \cdot 100 + d \\ 8 = 2 + d \\ \underline{6 = d} \end{cases}$$

$$\Rightarrow f(x) = y = 0,02 \cdot x + 6$$

S 2/61

wie Bsp. 2

Bsp. 3b) $P(\underline{-1} | -6)$ $Q(\underline{2} | \underline{0}) = P_2$

$$k = \frac{\Delta y}{\Delta x} = \frac{-6 - 0}{-1 - 2} = \frac{-6}{-3} = +2$$

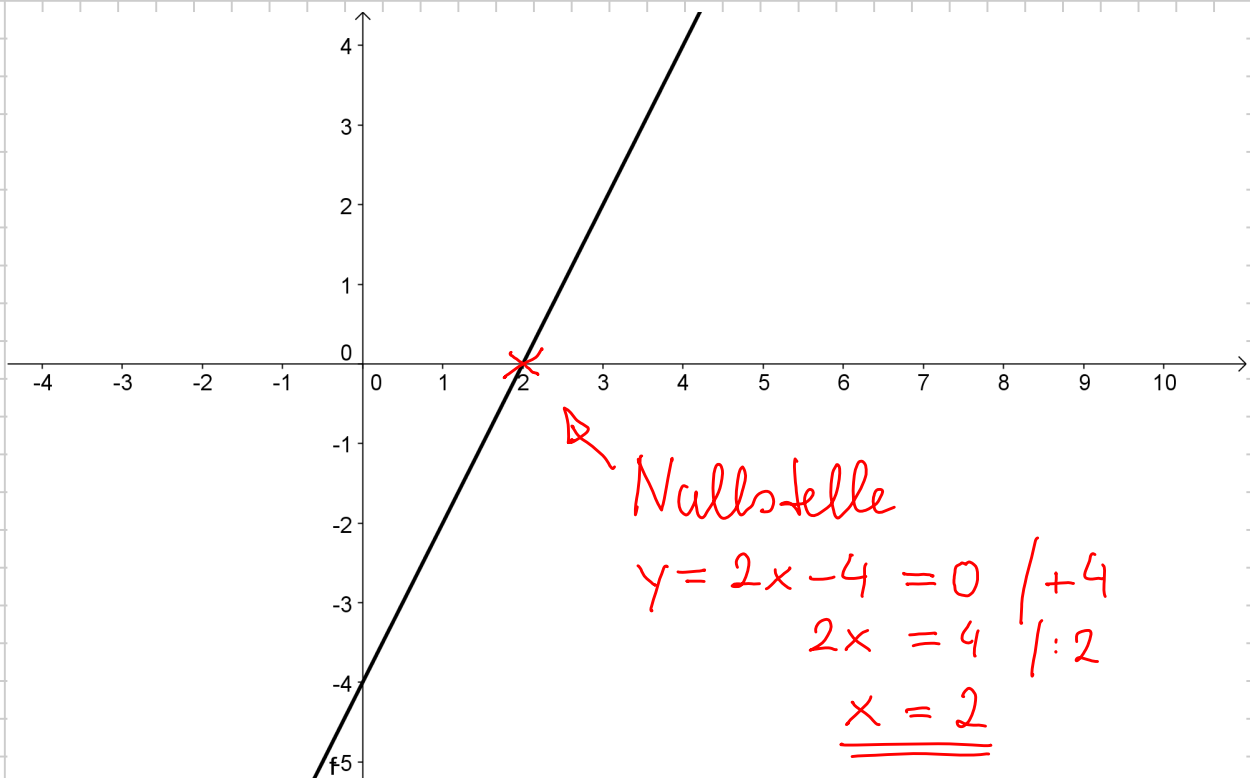
$$y = kx + d$$

$$0 = 2 \cdot 2 + d$$

$$0 = 4 + d$$

$$-4 = d$$

$$\Rightarrow f(x) = y = 2x - 4$$



S 2/3

$$3x + 2y = 5$$

$$2y = 5 - 3x \quad | :2$$

$$y = 2,5 - 1,5x = -1,5x + 2,5$$

$$7x + 7 = -4x + 3 + 8x$$

$$7x + 7 = 4x + 3$$

Bsp.

$$8x - 1 - 3(5x - 4) = 2(1 - 7x) - 26 \quad G = \mathbb{R}$$

$$8x - 1 - 15x + 12 = 2 - 14x - 26$$

$$-7x + 11 = -24 - 14x \quad | +14x \quad | -11$$

$$7x = -35 \quad | :7$$

$$x = -5$$

$$L = \{-5\}$$

S 2/5 Bsp. 6

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

$$x^2 - 4x + 4 - (x^2 + 6x + 9) = x^2 - 4 - (x^2 - 6x + 9)$$

$$\cancel{x^2} - 4x + 4 - \cancel{x^2} - 6x - 9 = \cancel{x^2} - 4 - \cancel{x^2} + 6x - 9$$

$$-10x - 5 = 6x - 13 \quad | +10x \quad | +13$$

$$8 = 16x \quad | :16$$

$$\frac{8}{16} \frac{1}{2} = x$$

$$0,5 = x$$

$$L = \{0,5\}$$

Bruchgleichungen

$$\frac{x}{5} + \frac{2x}{7} = 3$$

$$\frac{2-x}{5x^2+25x} - \frac{1+x}{x^2-25} = -\frac{6}{5x}$$

$$G = \mathbb{R}$$

Def.-Menge

N_1	$5x^2 + 25x$	$5x(x+5)$	$(x-5)$
N_2	$x^2 - 25$	$(x-5)(x+5)$	$5x$
N_3	$5x$	$5x$	$(x+5)(x-5)$

$$\text{HN: } \underset{x \neq 0}{5x} \cdot \underset{x \neq -5}{(x+5)} \cdot \underset{x \neq +5}{(x-5)} \neq 0$$

$$D = \mathbb{R} \setminus \{-5, 0, +5\}$$

ohne

$$\frac{(2-x)(x-5) - (1+x)5x}{\cancel{\text{HN}}} = \frac{-6(x+5)(x-5)}{\cancel{\text{HN}}} \quad / \cdot \text{HN} \neq 0$$

$$\begin{aligned} \cancel{2x} - \cancel{x^2} - \cancel{10} + \cancel{5x} - \cancel{5x} - \cancel{5x^2} &= -6(x^2 - 25) \\ \cancel{-6x^2} + 2x - 10 &= \cancel{-6x^2} + 150 \quad / +6x^2 \quad / +10 \\ 2x &= 160 \quad / :2 \\ &= 80 \end{aligned} \Rightarrow L = \{80\}$$

52/8 Bsp. 8

$$\frac{x-2}{x^2-9} - \frac{2-x}{3x^2-9x} = \frac{4}{3x}$$

$$(x-2)3x - (2-x)(x+3) = 4(x+3)(x-3)$$

$$3x^2 - 6x - (2x - x^2 - 3x + 6) = 4x^2 - 36$$

$$\cancel{3x^2} - \cancel{6x} - \cancel{2x} + \cancel{x^2} + \cancel{3x} - \cancel{6} = 4x^2 - 36$$

$$\cancel{4x^2} - 5x - 6 = \cancel{4x^2} - 36 \quad / +6$$

$$N_1 (x-3)(x+3)$$

$$N_2 3x(x-3)$$

$$N_3 3x$$

$$\text{HN } 3x(x-3)(x+3)$$

$$D = \mathbb{R} \setminus \{-3, 0, 3\}$$

$$-5x = -30 \quad | : (-5)$$

$$x = 6$$

$$L = \{6\}$$

Bsp 5
$$\frac{2y-1}{y^2-y} + \frac{4}{6y-6} - \frac{5}{2(y^2-1)} = \frac{8}{3y}$$

$$\text{kgV}(4, 8, 12) = 24$$

$N_1: \cancel{y(y-1)}$	$6(y+1)$
$N_2: \cancel{6(y-1)}$	$y(y+1)$
$N_3: \cancel{2(y-1)(y+1)}$	$3y$
$N_4: \cancel{3y}$	$2(y+1)(y-1)$

$$\text{HN: } 6y(y-1)(y+1)$$

$$D = \mathbb{R} \setminus \{-1, 0, +1\}$$

$$(2y-1) \cdot 6 \cdot (y+1) + 4y(y+1) - 5 \cdot 3y = 8 \cdot 2 \cdot (y+1)(y-1)$$

$$(2y-1) \cdot (6y+6) + 4y^2 + 4y - 15y = 16 \cdot (y^2-1)$$

$$12y^2 - 6y + 12y - 6 + 4y^2 + 4y - 15y = 16y^2 - 16$$

$$-5y - 6$$

$$-5y$$

$$y$$

$$= -16 \quad | +6$$

$$= -10 \quad | : (-5)$$

$$= 2$$

$$L = \{2\}$$