

Dziadek i babka mają razem 140 lat.
 Dziadek ma dwa razy tyle ile babka wtedy,
 kiedy on miał tyle, ile ona ma teraz.
 Ile lat mają dziadek i babka?

d - wiek d. t. t.
 b - wiek b. t. t.

$$\begin{cases} b + d = 140 \end{cases}$$

$$\begin{cases} d = 2 \cdot (b - (d - b)) \end{cases}$$

$$d = 140 - b$$

$$d = 2(b - d + b)$$

$$140 - b = 4b - 2(140 - b)$$

$$\begin{cases} b = 140 - d \\ 3d = 4b \end{cases}$$

$$3d = 4(140 - d)$$

$$3d = 560 - 4d$$

$$d = 80 \quad b = 60$$

$$Z: m > 1 \quad m \in \mathbb{N}_+ \quad \wedge x = 1 \wedge y = 1$$

$$T: \frac{x}{m+1} + \frac{y}{m-1} = \frac{2}{m^2-1}$$

$$\boxed{m=2}$$

 $m=3$

$$D: \frac{-1}{2+1} + \frac{1}{2-1} = \frac{2}{2^2-1}$$

$$L=P$$

$$\frac{-1}{10+1} + \frac{1}{999} = \frac{2}{999^2-1}$$

$$Z: m > 1 \quad m \in \mathbb{N}_+ \quad \wedge \underline{x=1} \wedge \underline{y=1}$$

$$T: \frac{x}{m+1} + \frac{y}{m-1} = \frac{2}{m^2-1} \quad \boxed{\begin{matrix} m=2 \\ m=3 \end{matrix}}$$

$$D: \frac{-1}{m+1} + \frac{1}{m-1} = \frac{2}{m^2-1} \quad \frac{1}{3} \quad \frac{1}{2}$$

$$L = \frac{-1}{m+1} + \frac{1}{m-1} = \frac{-(m-1)}{(m+1)(m-1)} + \frac{(m+1)}{(m+1)(m-1)} =$$

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

39)

$$2x + 4y = 18$$

$$x, y \in \mathbb{N}$$

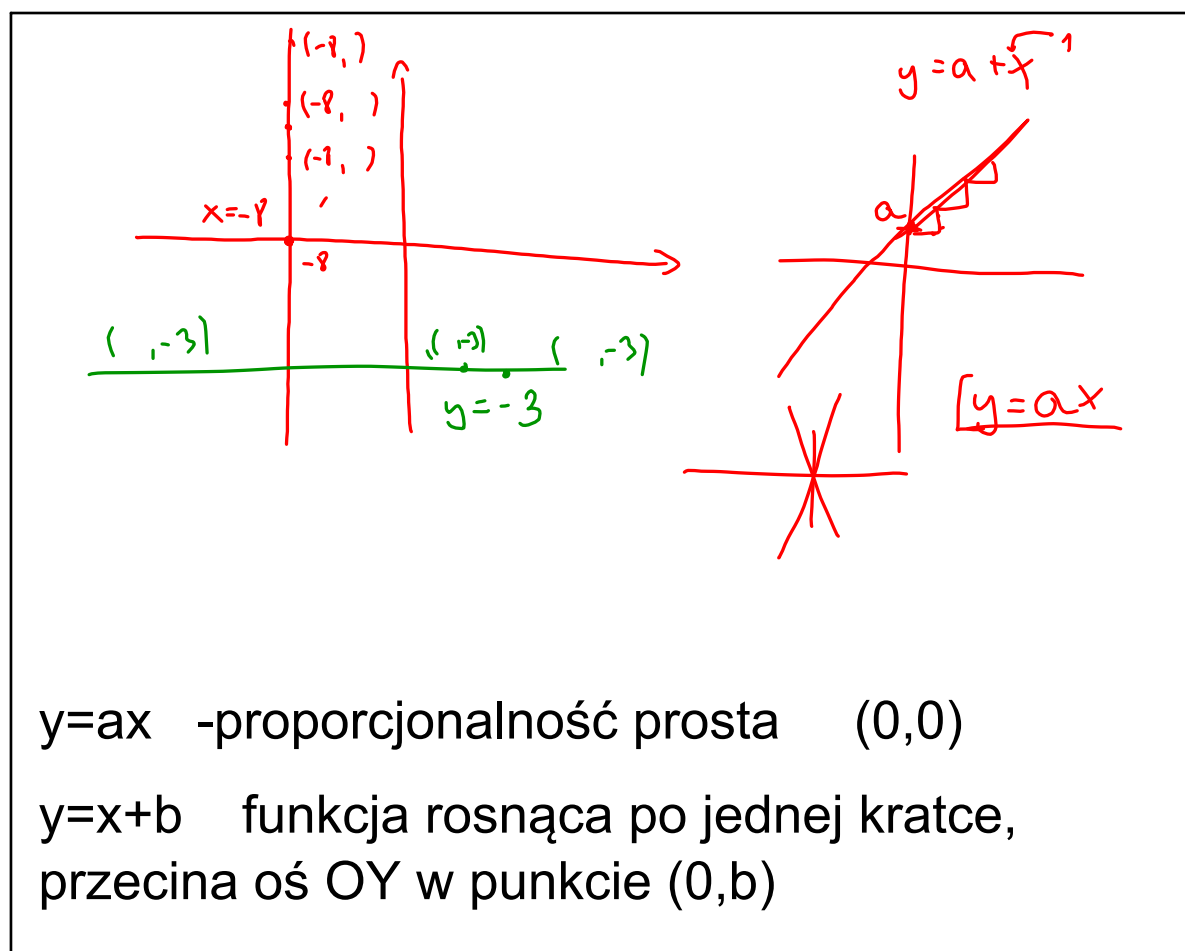
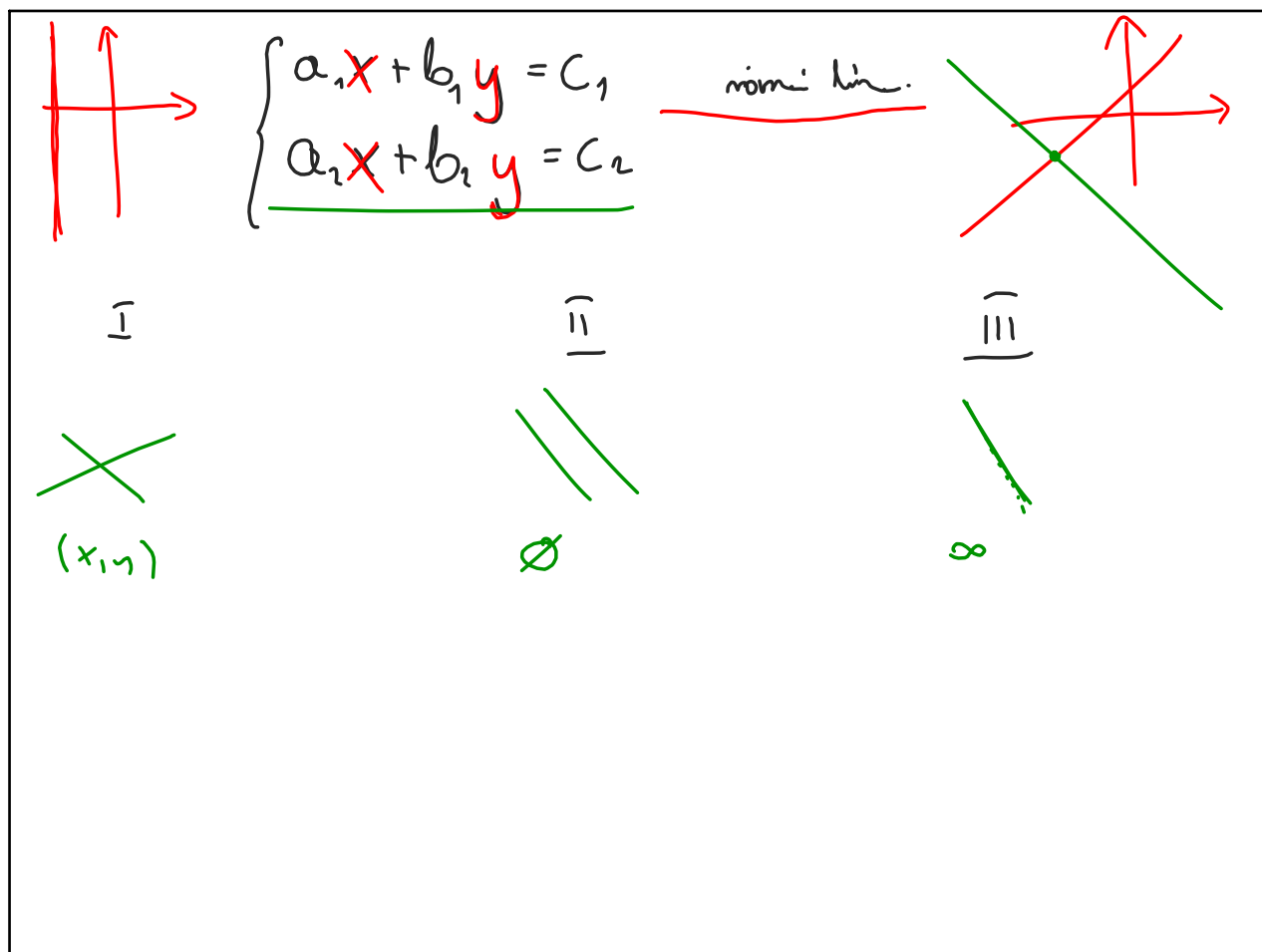
$$x = 9 - 2y$$

$$(9, 0) \quad (3, 3)$$

$$(7, 1) \quad (1, 4)$$

$$(5, 2) \quad \cancel{(0, 5)}$$

$$x, y \in \{0, 1, 2, 3, \dots\}$$



Układ dwóch równań liniowych z dwoma niewiadomymi, w postaci uporządkowanej.

$$\begin{cases} a_1x + b_1y = c_1 \\ a_2x + b_2y = c_2 \end{cases}$$

$\uparrow$ $\uparrow$
wz. wt.

I

Or. $\hat{=}$
wz. spr. $\hat{=}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\begin{cases} 2x + 3y = 30 \\ 4x + 6y = 58 \end{cases}$

∞
 $\hat{=}$
mnożymy

$\frac{1}{K_2}$
oznaczący
 (x, y)

$\frac{a_1}{a_2}$

$$\begin{cases} 2x + 3y = 30 & | \cdot (-2) \\ 4x + 6y = 58 & | : (-2) \end{cases} \quad \begin{cases} -4x - 6y = -60 \\ 4x + 6y = 58 \end{cases}$$

$$\begin{cases} 2x + 3y = 30 \\ -2x - 3y = -29 \end{cases}$$

$$\boxed{0 = -2} \text{ spr}$$

$$\emptyset$$

Two parallel lines representing no solution.

$\frac{a_1}{a_2} = \frac{b_1}{b_2}$ K $\begin{cases} a_1x + b_1y = c_1 \\ a_2x + b_2y = c_2 \end{cases}$ I

Wyznacznik $\downarrow$
 $W = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = a_1b_2 - a_2b_1 = 0$

$a_1b_2 = b_1a_2$
 $a_1b_2 - b_1a_2 = 0$ $\rightarrow \infty \leftarrow c$

$W_x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = c_1b_2 - b_1c_2 \neq 0$ prosta opisana
nie ma //

$W_y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = a_1c_2 - c_1a_2 \neq 0$

Wzrost mierny

(x, y) $\begin{cases} 2x + 3y = 30 \\ 2x + 3y = 30 \end{cases}$ $\begin{cases} 2x + 3y = 30 \\ 6x + 9y = 90 \end{cases}$

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\begin{cases} y = -\frac{2}{3}x + 10 \\ x \in \mathbb{R} \end{cases}$

$\begin{cases} x = 6 \\ y = -\frac{2}{3} \cdot 6 = -4 \end{cases} \quad (6, -4)$

$(3, 8)$ $\begin{cases} x = 3 \quad (\text{np } 3) \\ y = -\frac{2}{3} \cdot 3 + 10 = 8 \end{cases}$

$$\begin{cases} 2x + 3y = 30 \\ 6x + 9y = 90 \end{cases}$$

$$(W=0 \wedge W_x=0 \wedge W_y=0)$$

||
nie jest mierny
/ ∞

$$W = \begin{vmatrix} 2 & 3 \\ 6 & 9 \end{vmatrix} = 2 \cdot 9 - 3 \cdot 6 = 0$$

$$W_x = \begin{vmatrix} 30 & 3 \\ 90 & 9 \end{vmatrix} = 30 \cdot 9 - 3 \cdot 90 = 0$$

$$W_y = \begin{vmatrix} 2 & 30 \\ 6 & 90 \end{vmatrix} = 2 \cdot 90 - 30 \cdot 6 = 0$$

$$\begin{cases} a_1x + b_1y = c_1 \\ a_2x + b_2y = c_2 \end{cases} \quad \begin{matrix} \uparrow & \uparrow \\ & \text{wt.} \end{matrix}$$

1 row

$$W = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = a_1b_2 - b_1a_2 \neq 0$$

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

$$\hat{=} a_1b_2 \neq b_1a_2$$

$$\underline{a_1b_2 - b_1a_2 \neq 0}$$