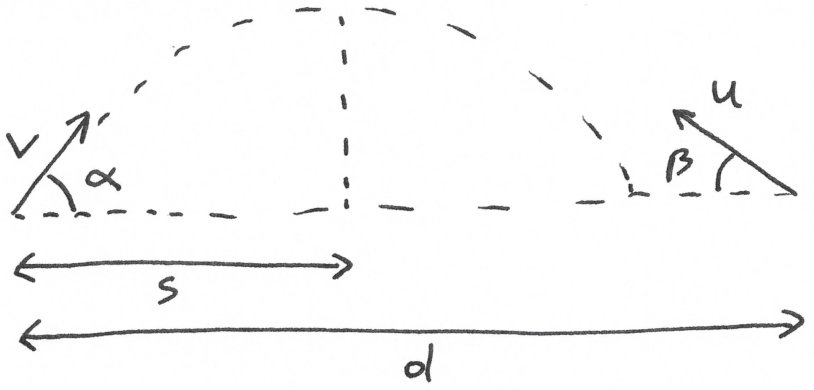
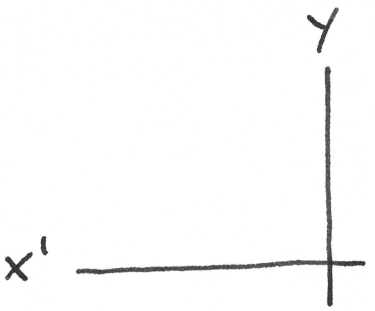
Zadanie 1



$$\begin{cases} u_y = v_y \\ 0 = v_y - gt \\ s = v_x t \\ u_{x'} t = d - s \end{cases}$$



$$u_{x'} = \frac{dg}{v_y} - v_x$$

$$u = \sqrt{u_{x'}^2 + u_y^2} = \sqrt{\frac{d^2 g^2}{v_y^2} - 2dg\frac{v_x}{v_y} + v_x^2 + v_y^2}$$

$$u = \sqrt{\frac{d^2 g^2}{v^2 \sin^2\alpha} - \frac{2dg}{\tan\alpha} + v^2}$$

$$\beta = \operatorname{arctan}\frac{u_y}{u_{x'}} = \operatorname{arctan}\frac{v_y}{\frac{dg}{v_y} - v_x}$$

$$\beta = \operatorname{arctan}\frac{v^2 \sin^2\alpha}{dg - v^2 \sin\alpha\cos\alpha}$$

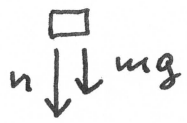
□

Zadanie 2

(i)

A: 

$$9mg = m\frac{V_A^2}{R}$$

B: 

$$n + mg = m\frac{V_B^2}{R}$$

$$\frac{1}{2}mV_A^2 = \frac{1}{2}mV_B^2 + 2mgR$$

$$\frac{1}{2}9mgR = \frac{1}{2}(n+mg)R + 2mgR$$

$$n = 4mg$$

(ii)

$$n = 2mg$$

$$\frac{1}{2}mV_A^2 = \frac{1}{2}mV_B^2 + 2mgR + |W_T|$$

$$\frac{1}{2}9mgR = \frac{1}{2}3mgR + 2mgR + f_{śr}\pi R$$

$$f_{śr} = \frac{mg}{\pi}$$

(iii)

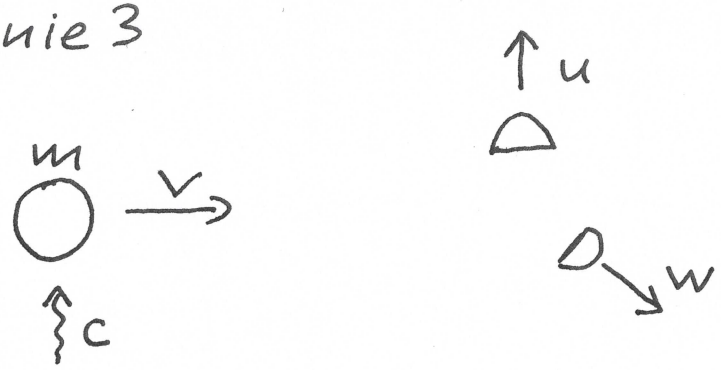
$$f_{śr} = \mu n_{śr}$$

$$\frac{mg}{\pi} = \mu\frac{10mg + 2mg}{2}$$

$$\mu = \frac{1}{6\pi} \approx 0{,}05$$

□

Zadanie 3

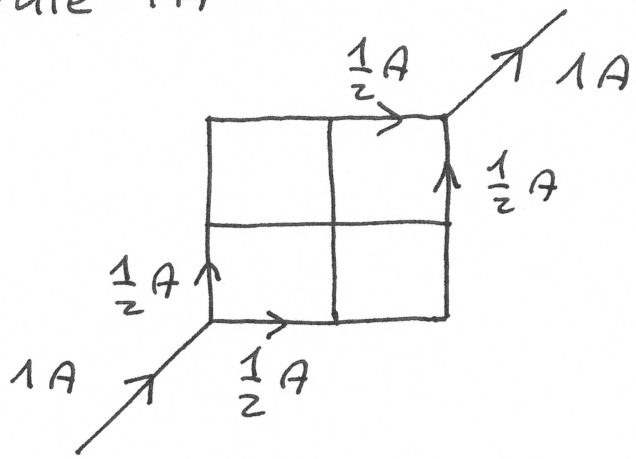


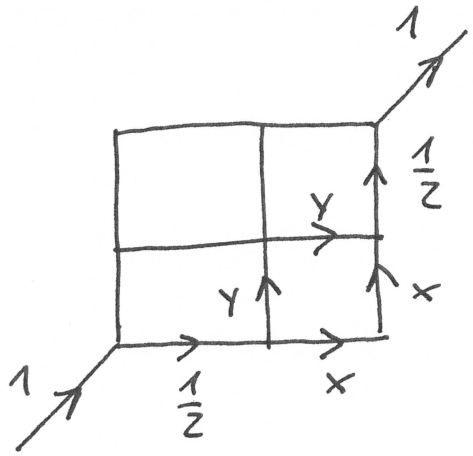
$$\begin{cases} \frac{1}{2} m v^2 + h\frac{c}{\lambda} = \frac{1}{2}\frac{m}{2}u^2 + \frac{1}{2}\frac{m}{2}w^2 + E \\ mv = \frac{m}{2} w_x \\ \frac{m}{2} u = \frac{m}{2} w_y \end{cases}$$

$$E = \frac{1}{2} m v^2 + h\frac{c}{\lambda} - \frac{1}{4} m u^2 - \frac{1}{4} m (w_x^2 + w_y^2)$$

$$E = h\frac{c}{\lambda} - \frac{1}{2} m v^2 - \frac{1}{2} m u^2 \quad \square$$

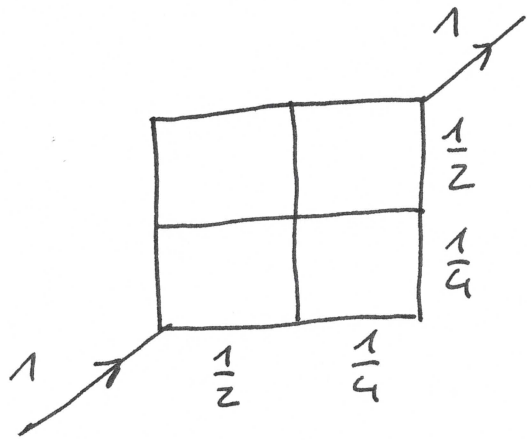
Zadanie 4A





$$Y \cdot 1\Omega + Y \cdot 1\Omega = x \cdot 1\Omega + x \cdot 1\Omega$$

$$Y = x$$

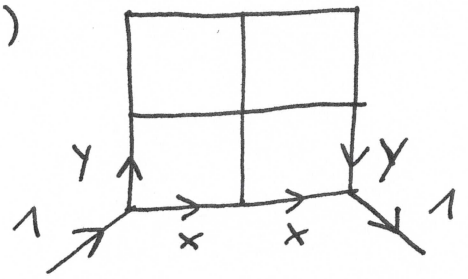


$$\frac{\frac{1}{2} \cdot 1 + \frac{1}{4} \cdot 1 + \frac{1}{4} \cdot 1 + \frac{1}{2} \cdot 1}{1} = \frac{3}{2}\Omega$$

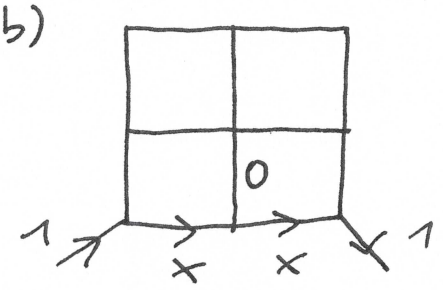
□

Zadanie 4B

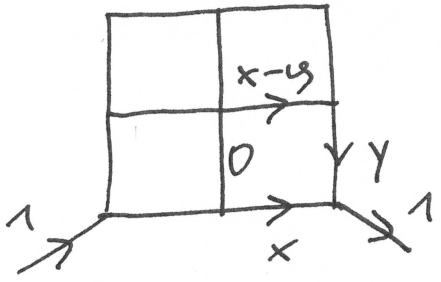
(a)



(b)

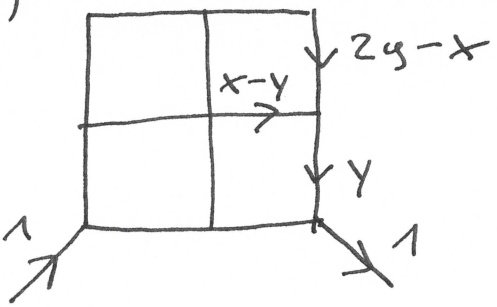


(c)

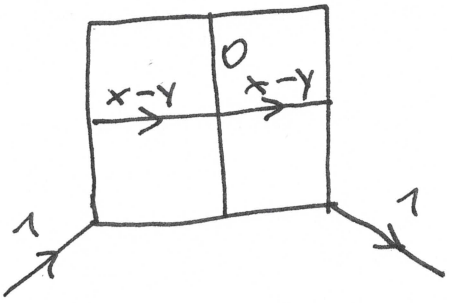


$(x-y)\cdot 1 + y\cdot 1 = x\cdot 1$

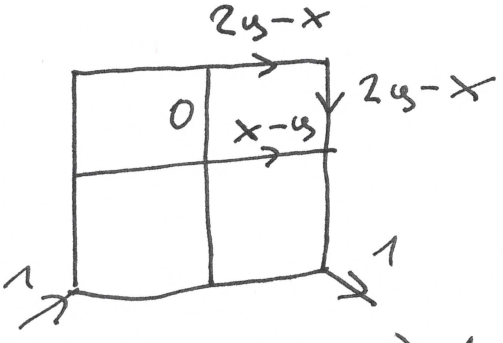
(d)



(e)



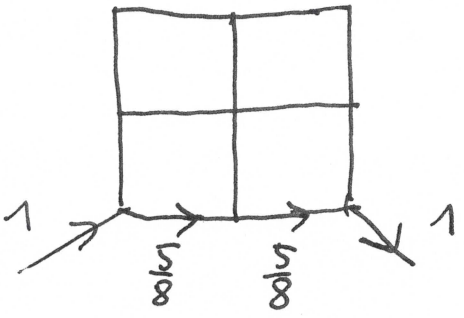
(f)



$$\begin{cases} (2y-x)\cdot 2 = (x-y)\cdot 1 \\ x+y=1 \end{cases}$$

$$x = \frac{5}{8}$$

(g)



$$\frac{\frac{5}{8}\cdot 1 + \frac{5}{8}\cdot 1}{1} = \frac{5}{4}\ \Omega$$

□