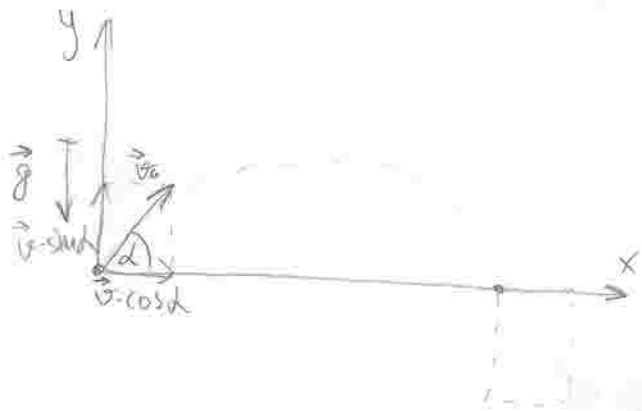


# Rzut ukośny



$$\begin{cases} x = v_0 \cdot \cos \alpha \cdot t \rightarrow t = \frac{x}{v_0 \cdot \cos \alpha} \\ y = v_0 \cdot \sin \alpha \cdot t - \frac{g t^2}{2} \end{cases}$$

$$y = v_0 \cdot \sin \alpha \cdot \frac{x}{v_0 \cdot \cos \alpha} - \frac{g}{2} \cdot \left( \frac{x}{v_0 \cdot \cos \alpha} \right)^2$$

$$y = \frac{\sin \alpha}{\cos \alpha} \cdot x - \frac{1}{2} \cdot g \cdot \frac{x^2}{v_0^2 \cdot \cos^2 \alpha}$$

$$y = - \frac{g}{2 \cdot v_0^2 \cdot \cos^2 \alpha} \cdot x^2 + \operatorname{tg} \alpha \cdot x$$

$$y = x \left( \operatorname{tg} \alpha - \frac{g}{2 v_0^2 \cdot \cos^2 \alpha} \cdot x \right)$$

$$0 = x (\operatorname{tg} \alpha - c \cdot x) \quad c = \text{constant}$$

$$x_1 = 0$$

$$c \cdot x_2 = \operatorname{tg} \alpha$$

$$x_2 = \frac{1}{c} \cdot \operatorname{tg} \alpha$$

$$\Delta = \operatorname{tg}^2 \alpha$$

$$x_2 = \left( -(-\operatorname{tg} \alpha) - \operatorname{tg} \alpha \right) \cdot \frac{1}{2} \cdot \frac{-2 \cdot v_0^2 \cdot \cos^2 \alpha}{g}$$

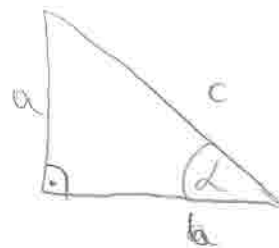
$$x = \frac{2 \sin^2 \alpha}{2 \cos^2 \alpha} \cdot \frac{v_0^2 \cdot \cos^2 \alpha}{g}$$

$$\vec{g} = - \frac{GM}{r^2} \cdot \frac{\vec{r}}{r}$$

$$g = \frac{G \cdot M}{r^2}$$

$$\begin{cases} v = v_0 + a \cdot t \\ s = v_0 \cdot t + \frac{a t^2}{2} \end{cases}$$

$$\frac{\sin x}{\cos x} = \operatorname{tg} x$$



$$\operatorname{tg} \alpha = \frac{a}{b}$$

$$\text{jeśli } \alpha = \frac{\pi}{4} \text{ to } a = b$$

$$\rightarrow \operatorname{tg} \alpha = 1$$

$$\text{jeśli } b \rightarrow 0 \text{ to } \operatorname{tg} \alpha \rightarrow \infty$$

$x_2$  jest największe dla  $\alpha = \frac{\pi}{4}$

$$f(x) = a \cdot x^2 + b x + c$$

$$\Delta = b^2 - 4a \cdot c$$

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a}$$

$$x_2 = \frac{-b + \sqrt{\Delta}}{2a}$$

$$y = -\frac{g \cdot x^2}{2 \cdot v_0^2 \cdot \cos^2 \alpha} + \operatorname{tg} \alpha \cdot x$$

$$0 = -\frac{g \cdot x^2}{2 \cdot v_0^2 \cdot \cos^2 \alpha} + \operatorname{tg} \alpha \cdot x$$

$$\Delta = b^2 - 4ac$$

$$\Delta = \operatorname{tg}^2 \alpha$$

$$x_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-2 \operatorname{tg} \alpha}{2a} = -2 \cdot \frac{\sin \alpha}{\cos \alpha} \cdot \frac{-2 \cdot v_0^2 \cdot \cos^2 \alpha}{g} \cdot \frac{1}{2}$$

$$x_1 = \sin \alpha \cdot \frac{2 \cdot v_0^2 \cdot \cos \alpha}{g}$$

$$x_1 = \frac{v_0^2}{g} \cdot 2 \cdot \sin \alpha \cdot \cos \alpha$$

$$x_1 = \frac{v_0^2}{g} \cdot \sin 2\alpha$$

$$x_1 = x_{\max} \quad \text{dla} \quad \alpha = \frac{\pi}{4} \rightarrow \sin 2\alpha = 1$$

$$x_2 = 0$$

$$\left. \begin{array}{l} \\ \\ \end{array} \right\} 2 \cdot \sin \alpha \cdot \cos \alpha = \sin 2\alpha$$