

## Function's derivative definition

Function derivative is defined by following formula:

$$\frac{dy(x)}{dx} = \lim_{\Delta x \rightarrow 0} \frac{y(x + \Delta x) - y(x)}{\Delta x}$$

Let's consider following example function  $y(x) = 2 \cdot x$

$$\frac{dy(x)}{dx} = \frac{d(2 \cdot x)}{dx} = \lim_{\Delta x \rightarrow 0} \frac{2 \cdot (x + \Delta x) - 2 \cdot x}{\Delta x}$$

$$\frac{dy(x)}{dx} = \lim_{\Delta x \rightarrow 0} \frac{2 \cdot x + 2 \cdot \Delta x - 2 \cdot x}{\Delta x} = \lim_{\Delta x \rightarrow 0} \frac{2 \cdot \Delta x}{\Delta x}$$

$$\frac{dy(x)}{dx} = \lim_{\Delta x \rightarrow 0} \frac{2 \cdot \Delta x}{\Delta x}$$

$$\frac{dy(x)}{dx} = 2 \cdot \lim_{\Delta x \rightarrow 0} \frac{\Delta x}{\Delta x}$$

$$\frac{dy(x)}{dx} = 2 \cdot \lim_{\Delta x \rightarrow 0} 1$$

$$\frac{dy(x)}{dx} = 2$$

$$\frac{d(2 \cdot x)}{dx} = 2$$