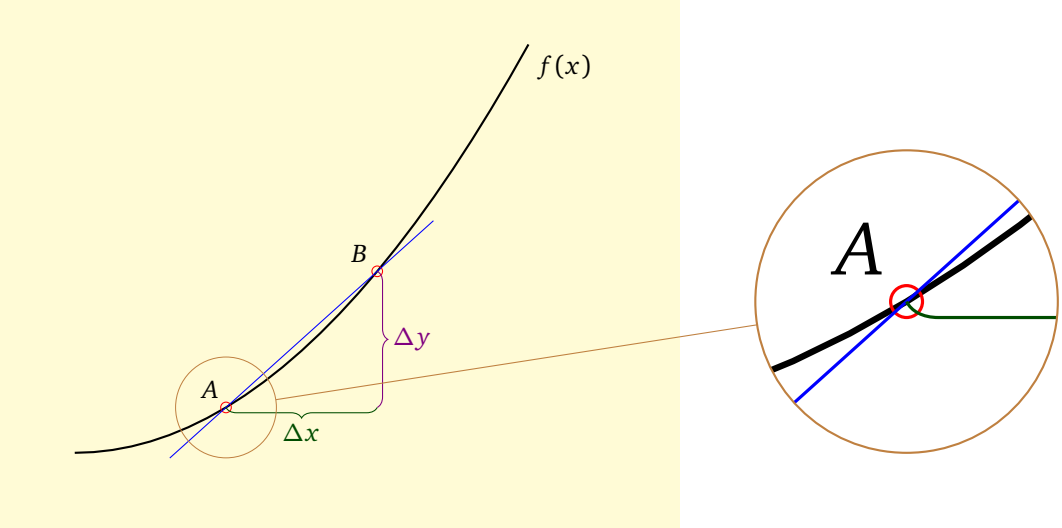

Figure 1: Part of the function $f(x) = x^2$.

The slope of the line through the points A and B is:

$$\text{slope}_{AB} = \frac{\Delta y}{\Delta x} = \frac{f(x+\Delta x) - f(x)}{\Delta x} \tag{1}$$

We want to determine the slope in point A. Therefore, we move point B to point A. This means that Δx will slowly become 0. This way, we get a *limit*.

$$\text{slope}_A = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} \tag{2}$$

Note that this limit will give us a *function*.

Example

Find the slope in point $A(1,1)$ for the function $f(x) = x^2$.

First we calculate the limit funtion:

$$\begin{aligned}
\text{slope}_A &= \lim_{\Delta x \to 0} \frac{(x+\Delta x)^2 - x^2}{\Delta x} \\
&= \lim_{\Delta x \to 0} \frac{x^2 + 2x\Delta x + (\Delta x)^2 - x^2}{\Delta x} \\
&= \lim_{\Delta x \to 0} \frac{2x\Delta x + (\Delta x)^2}{\Delta x} \\
&= \lim_{\Delta x \to 0} 2x + \Delta x \\
&= 2x
\end{aligned} \tag{3}$$

The slope in $A(1,1)$ is 2.