



**Definition**

Let  $f : \mathbf{R}^n \rightarrow \mathbf{R}$ . Let  $a \in \mathbf{R}^n$  and pick  $\delta \in \mathbf{R}^n$ , if the limit

$$\lim_{t \rightarrow 0} \frac{f(a + t\delta) - f(a)}{t}$$

exists, then we say that  $f$  is *differentiable at  $a$  in the direction  $x$* . We call the value of the limit the *directional derivative* of  $f$  at  $a$ , in the direction  $\delta$ .



