# derivative of a function

example

y
x

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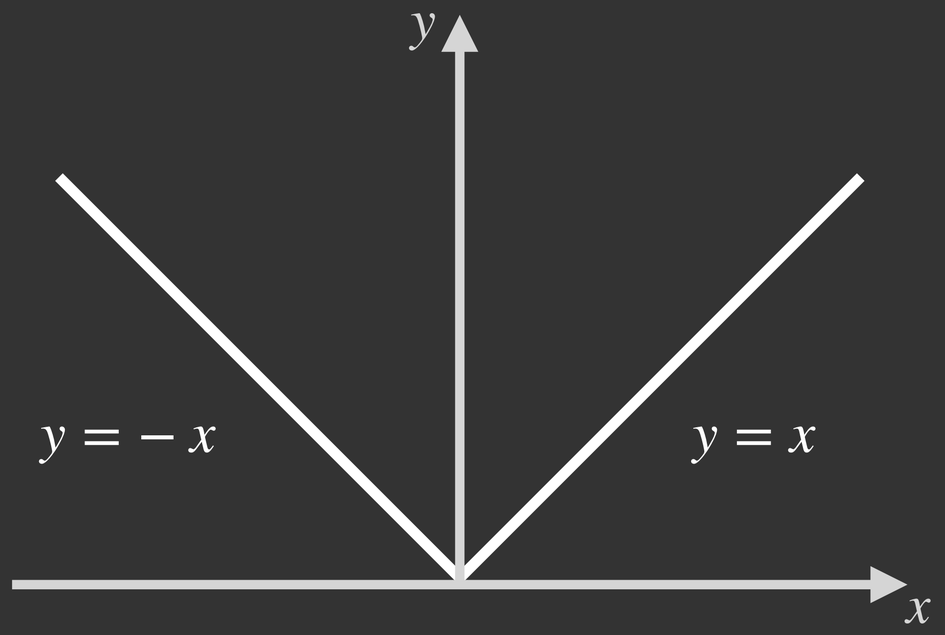
## example

$$f(x) = |x| = \begin{cases} x = & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$




is not differentiable at a certain point because it is not continuous at (0,0), we can draw many many many tangent lines there. Also:

for $h > 0$, $\dfrac{f(0+h) - f(0)}{h} = \dfrac{h - 0}{h} = 1$

for $h < 0$, $\dfrac{f(0+h) - f(0)}{h} = \dfrac{-h - 0}{h} = -1$

i.e. $\lim\limits_{h \to 0} \dfrac{f(0+h) - f(0)}{h}$ does not exist since taking the limit from both sides must give the same answer.

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