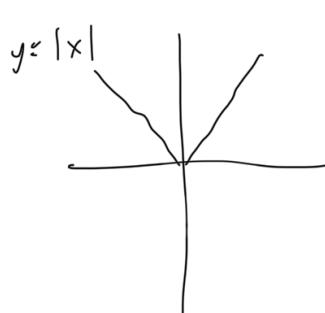


The Derivative of $|x|$

The slope of the graph of $f(x) = |x|$ changes abruptly when $x = 0$. Does this function have a derivative? If so, what is it? If not, why not?

The function $f(x) = |x|$ has a derivative. Its derivative



would be $\frac{dy}{dx} |x| = 1$. Its tangent will also be similar to its graph.

$$\lim_{\Delta x \rightarrow 0} \frac{\Delta f}{\Delta x} = \frac{|(x + \Delta x)| - |x|}{\Delta x}$$

$$= \frac{1}{\Delta x} (\Delta x)$$

$$m \approx 1$$

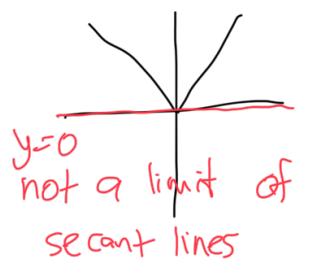
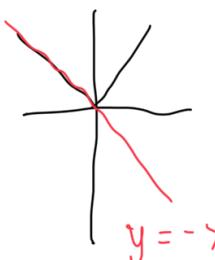
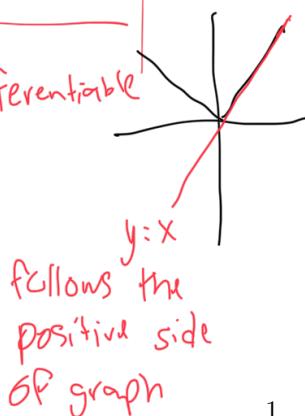
Comments from Solution

Answer:

$$f'(x) = \begin{cases} 1 & x > 0 \\ -1 & x < 0 \end{cases}$$

BUT at $x = 0$, it is not differentiable.

A function that is not differentiable at even one point is not a differentiable function.



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18.01SC Single Variable Calculus
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