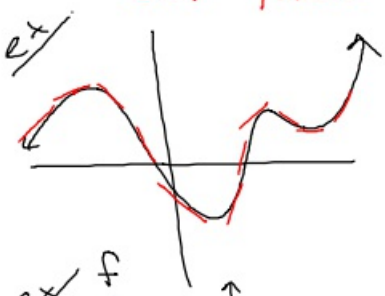
Differentiability

↳ deals with Derivatives → slope of the tangent line

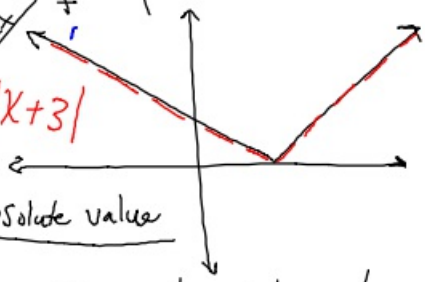
*A function is differentiable at a point if there is a unique tangent line with a defined slope at that point."

(as opposed to undefined slope... yes, Differentiable. So, the tangent line must not be vertical.)

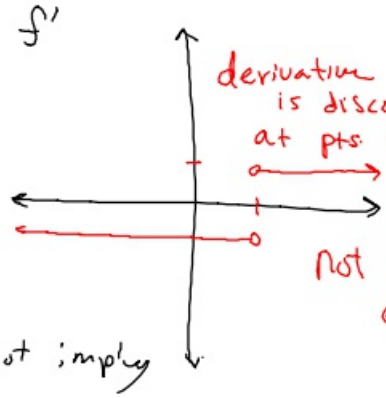
ex/



ex/ $f = |x+3|$



absolute value



derivative is discontinuous at pts. where the func. is not differentiable.

Continuity does not imply differentiability.

ex/ $f(x) = \sqrt[3]{x-1}$

ex $\sqrt[4]{x-1}$

$x-1 \geq 0$

f is continuous.

$f'(x) = \frac{d}{dx}(x-1)^{1/3}$

$f'(x) = \frac{1}{3}(x-1)^{-2/3} \cdot 1 = \frac{1}{3\sqrt[3]{(x-1)^2}}$

f' is discontinuous. b/c f'(1) is undefined.

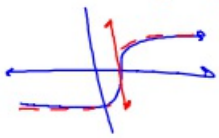
what makes denominator = 0 ? f'

$x = 1$ $f'(1) = \frac{1}{3(0)} = \frac{1}{0}$!!

where is f non-differentiable?

@ x = 1, b/c tangent line is vertical.

↳ the derivative f' is not continuous @ 1.



f differentiable where f' is continuous

ex/ where is f non-diff?

$$f(x) = \frac{x^2}{x-1} \qquad f'(x) = \frac{x^2-2x}{(x-1)^2}$$

$$x \neq 1$$

f is non diff @ $x=1$ b/c $f'(1)$ is undefined.

(not continuous @ $x=1$)

★ Differentiability implies continuity ★

If f' is continuous, then f must also be cont. ★