Lecture 14

Monday, October 24, 2022 7:37 AM

* Questions

Meanings of derivative:

$$f'(a) = \lim_{h\to 0} \underbrace{\frac{f(a+h)-f(a)}{h}}_{\text{average rate of change of } f \text{ between } a \text{ and } a+h}$$

slope of the tangent line to the graph of f at $(a, f(a))$.

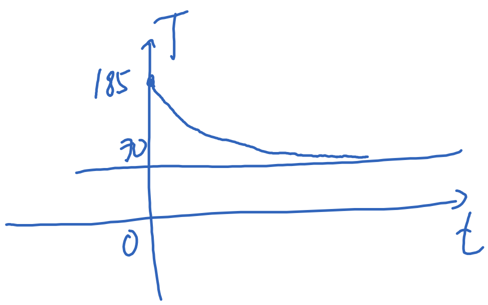
instantenous rate of change of f at $x=a$.

<u>Ex</u> turkey out from oven $\to$ 185°F

leaving it in room temperature. 70°F

After 60 mins : 75°F

$$\text{Average rate of change of temperature} = \frac{75-185}{60} = \frac{-110}{60} \approx -1.83$$



After 1 min : 182°F

$$\text{average rate of change} = \frac{182-185}{1} = -3$$

<u>Sidenotes</u>

$T' \sim 70 - T$ (Newton's law of cooling)

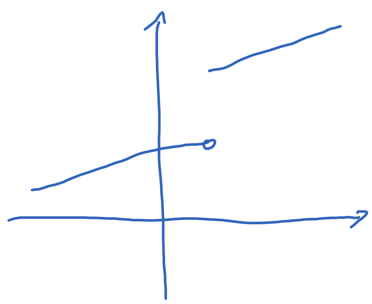
$T = 115 + 70e^{-\alpha t}$

Differentiable functions

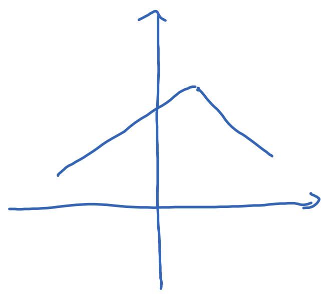
f is said to be <u>differentiable</u> at $x = a$ if $f'(a)$ exists.

Geometrically, f is diff. at a if the graph of f has a well-defined tangent line which is non-vertical at $(a, f(a))$.

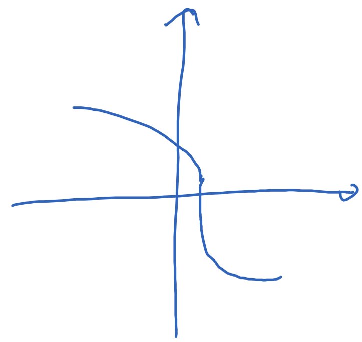
What can go wrong?

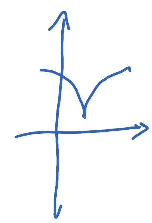


not continuous



corner





cusp

vertical tangent lines

f is differentiable on (a,b) if it is differentiable everywhere on the interval (a,b).