

# PROPERTIES OF DERIVATIVES

Today we will discuss some of useful derivative properties that are actually used in math and Machine Learning. Next paper will be about optimization

## MULTIPLICATION BY SCALAR

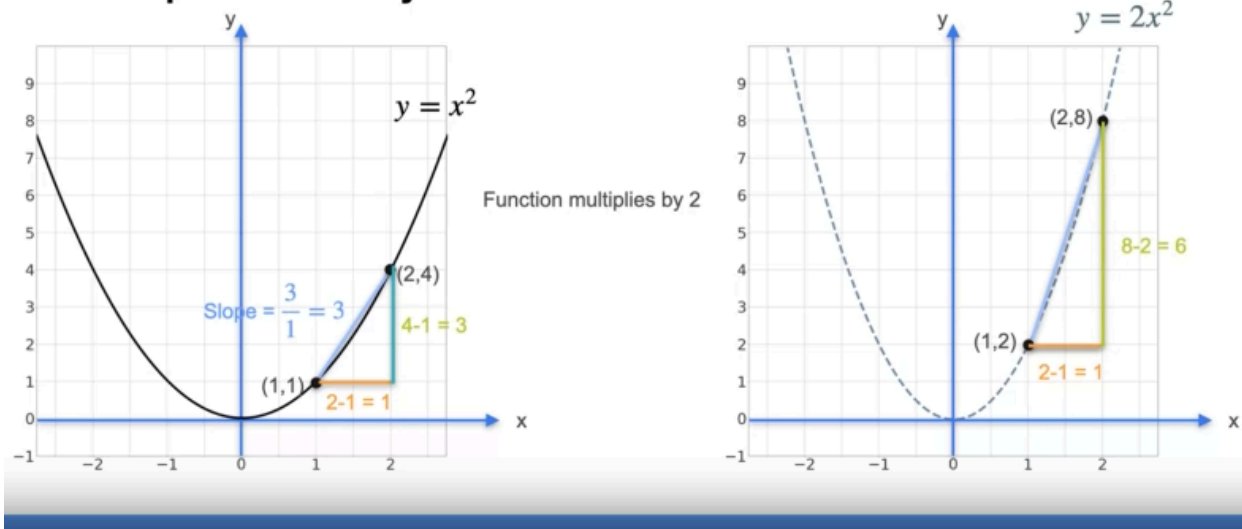
$$f = cg$$

$$f' = cg'$$

(if our function  $f = \text{const } c * \text{function } g$ )

Derivative of  $f$  is gonna be derivative of  $g$  times  $c$ )

We can easily plot it to proof

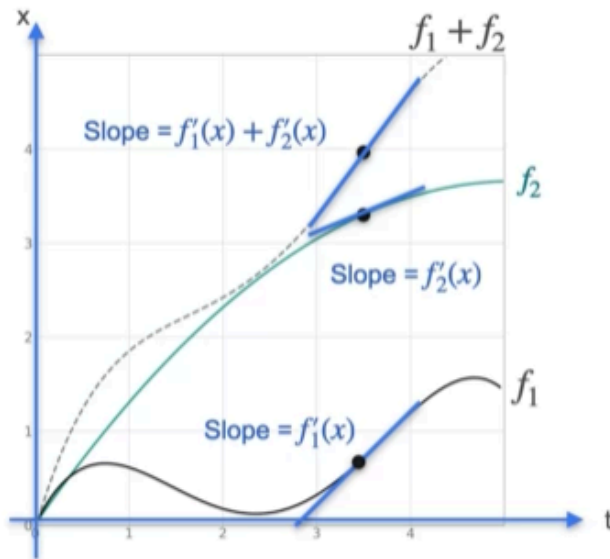


## SUM RULE

$$f = c + g$$

$$f' = c' + g'$$

(where  $f$ ,  $c$ , and  $g$  - functions)



$$f = f_1 + f_2$$



$$f' = f_1' + f_2'$$

### PRODUCT RULE

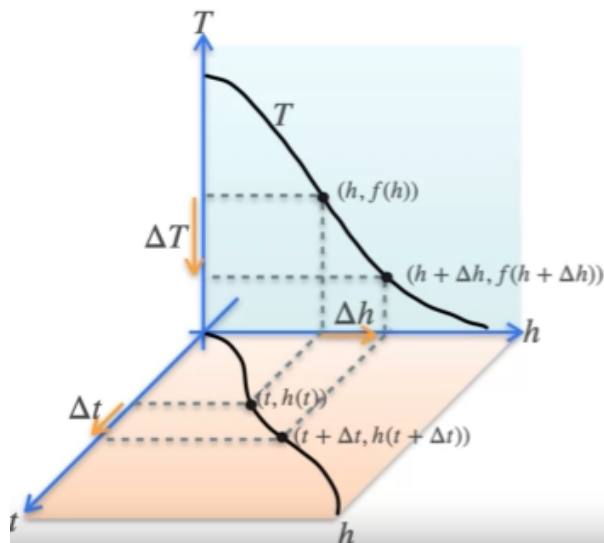
$$f = gh$$

$$f' = g'h + gh'$$

(where f, h, and g - functions)

### CHAIN RULE

$$d/dt = f(g(h(t))) = df/dg * dg/dh * dh/dt$$



$$\Delta t \rightarrow \Delta h \rightarrow \Delta T$$

$$\frac{\Delta T}{\Delta t} = \frac{\Delta T}{\Delta h} \frac{\Delta h}{\Delta t}$$

Sorry for such a short and brief paper.  
I'm really tired now, as I've been working all day.  
This is probably the best I could write here.  
(it's hard to deal with formulas in docs).  
Also I quit MIT course for a while  
(cuz it's too deep for now, and it doesn't give particular essence of calculus in Machine Learning)

Anyways:



I'll read 1984 and go to sleep...

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This material is free to use, share, and criticize.

Written by Venchislav for the GitHub community♥.

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GoodBye!