Part 2 데이터 사이언스 인공지능

[Ch 02.] Jacobian Matrix & Backpropagation

[CH02.] 01

Lecture.2

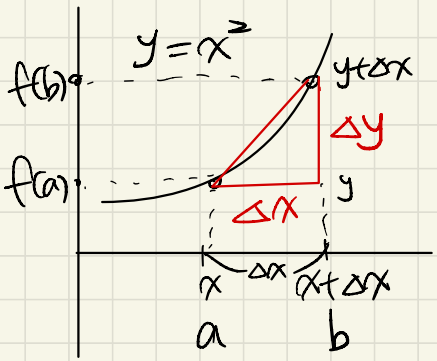
Basic Differentiation

YHJ

CH02_01. Rate_of_Changes

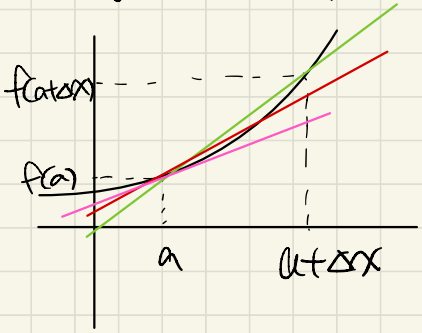
<Rate of Changes>

- Average Rate of Change



$$\frac{\Delta y}{\Delta x} = \frac{f(b)-f(a)}{b-a}$$

- Instantaneous Rate of Change



$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} \frac{f(a+\Delta x)-f(a)}{\Delta x}$$

$$\lim_{h \to 0} \frac{f(a+h)-f(a)}{h} = f'(a) = \frac{dy}{dx}\Big|_{x=a}$$

CH02.02. Differentiation_and_Derivatives

<Derivatives and Differentiation>

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

$f(x)=x^2$

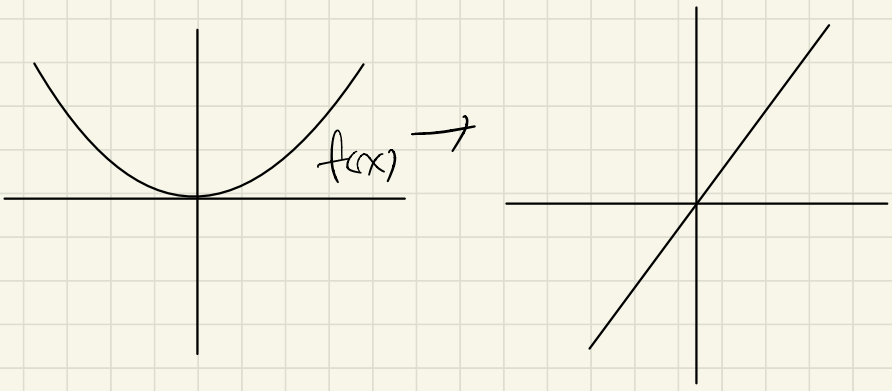
$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}=\lim_{h\to 0}\frac{(x+h)^2-x^2}{h}$$

$$=\lim_{h\to 0}\frac{x^2+2xh+h^2-x^2}{h}=\lim_{x\to 0}[2x+h]=2x$$

$f(-2)=2\cdot(-2)=-4$

$f'(0)=2\cdot 0=0$

$f'(2)=2\cdot 2=4$



CH 02-03. Diff_of_Constant_and_Power_Functions

<Diff of Basic Functions>

- Constant Functions

$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}=\lim_{h\to 0}\frac{c-c}{h}=0$$

$f(x)=c \rightarrow f'(x)=0$

$f(x)=100$

$f(x)=e^2-\ln(30)$

- power Functions

$f(x)=x^c$

$f(x)=x^2$

$f(x)=x^{10}$

$f(x)=\frac{1}{x} \cdots > f(x)=x^{-1} \cdots > f'(x)=-1\,x^{-1-1}=-x^{-2}$

$f(x)=\frac{1}{x^2} \cdots > f(x)=x^{-2} \cdots > f'(x)=-2\,x^{-2-1}=-2\frac{1}{x^3}$

$f(x)=\sqrt{x} \cdots > f(x)=x^{\frac{1}{2}} \cdots > f'(x)=\frac{1}{2}x^{\frac{1}{2}-1}=\frac{1}{2}x^{-\frac{1}{2}}$

$=\frac{1}{2\sqrt{x}}$