

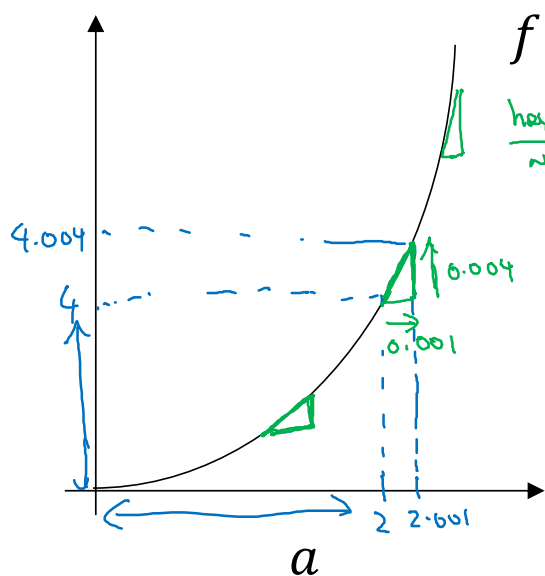


deeplearning.ai

Basics of Neural Network Programming

More derivatives
examples

Intuition about derivatives



$$f(a) = a^2$$

height
width

$$\frac{d}{da} a^2 = 2a$$

$$0.001$$

$$(2a) \times 0.001$$

$0.001 \leftarrow$
 $0.000000000001 \leftarrow$

$a=2$ $f(a)=4$
 $a=2.001$ $f(a) \approx 4.004$
 (4.0040001)
 slope (derivative) of $f(a)$ at
 $a=2$ is 4 .

$$\frac{d}{da} f(a) = 4 \quad \text{when } a=2$$

$a=5$ $f(a)=25$
 $a=5.001$ $f(a) \approx 25.010$

$$\frac{d}{da} f(a) = 10 \quad \text{when } a=5$$

$$\frac{d}{da} f(a) = \frac{d}{da} a^2 = 2a$$

More derivative examples

$$f(a) = a^2$$

$$\frac{d}{da} f(a) = \frac{2a}{4}$$

$$a = 2$$

$$f(a) = 4$$

$$a = 2.001$$

$$f(a) \approx 4.004$$

$$f(a) = a^3$$

$$\frac{d}{da} f(a) = \frac{3a^2}{3 \times 2^2 = 12}$$

$$a = 2$$

$$f(a) = 8$$

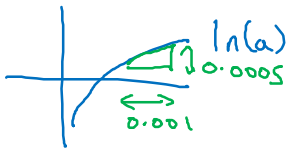
$$a = \underline{2.001}$$

$$f(a) \approx \underline{8.012}$$

$$f(a) = \log_e(a)$$

$$\ln(a)$$

$$\frac{d}{da} f(a) = \frac{1}{a}$$



$$\frac{d}{da} f(a) = \boxed{\frac{1}{2}}$$

↑

$$a = 2$$

$$f(a) \approx 0.69315$$

$$a = \underline{2.001}$$

$$\underline{f(a) \approx 0.69365}$$

$$\downarrow$$

$$0.0005 \leftarrow \underline{0.0005}$$