deeplearning.ai

Setting up your optimization problem

Numerical approximation of gradients

Checking your derivative computation

$J \to f(\theta) = \theta^3$

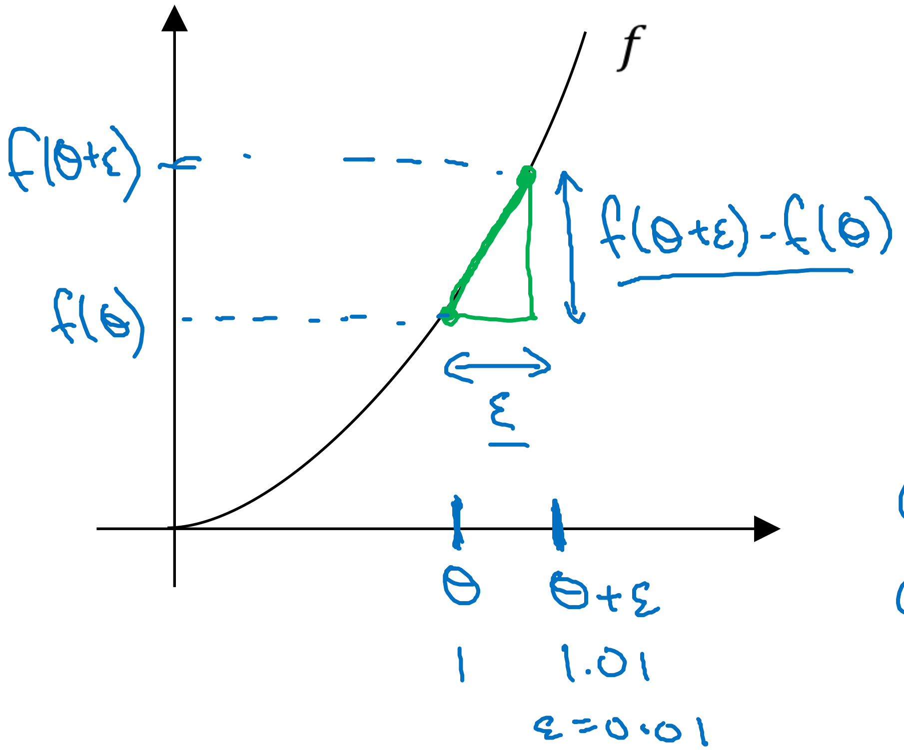
$\theta \in \mathbb{R}$.

$g(\theta) = \frac{d}{d\theta} f(\theta) = f'(\theta)$

$dw, db \to g(\theta) = 3\theta^2$.

$g(\theta) = 3 \cdot (1)^2 = 3$ when $\theta = 1$

$$\boxed{\frac{f(\theta+\varepsilon) - f(\theta)}{\varepsilon} \approx g(\theta)}$$



$\theta = 1$

$\theta + \varepsilon = 1.01$

$$\frac{(1.01)^3 - 1^3}{0.01} = 3.0301 \approx 3$$

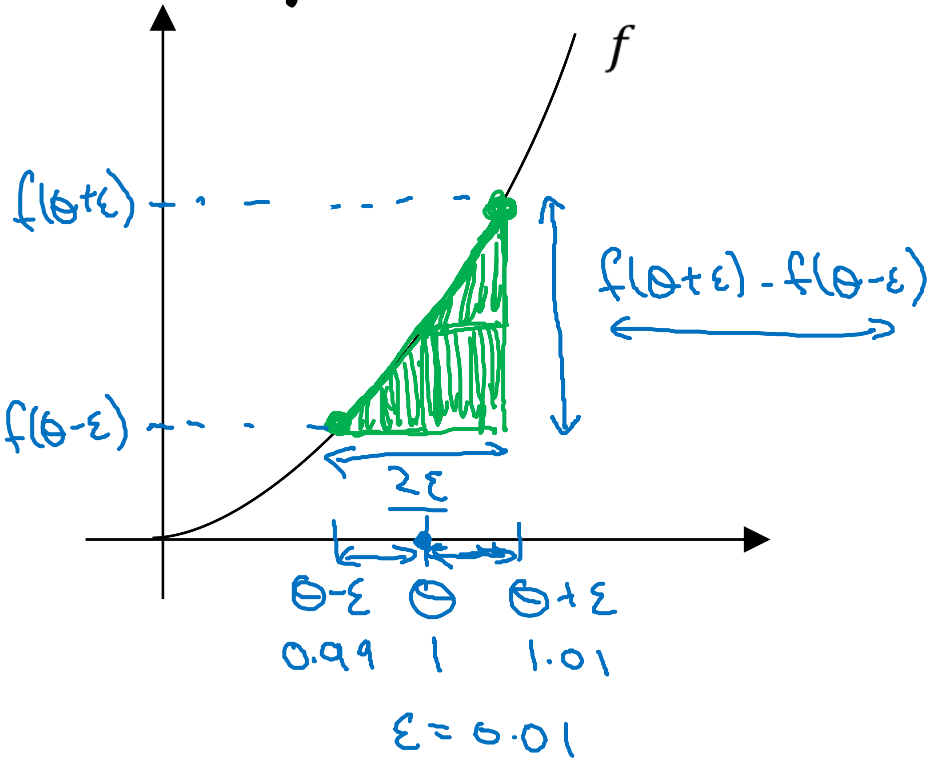
0.0301

3.1

3.2

Checking your derivative computation

$f(\theta) = \theta^3$



$$\frac{f(\theta+\varepsilon)-f(\theta-\varepsilon)}{2\varepsilon} \approx g(\theta)$$

$$\frac{(1.01)^3-(0.99)^3}{2(0.01)} = 3.0001 \approx 3$$

$$g(\theta) = 3\theta^2 = 3$$

approx error: 0.0001

(prev slide: 3.0301. error: 0.03)

$$f'(\theta) = \lim_{\varepsilon \to 0} \frac{f(\theta+\varepsilon)-f(\theta-\varepsilon)}{2\varepsilon}$$

$O(\varepsilon^2)$

0.01

0.0001

$$\frac{f(\theta+\varepsilon)-f(\theta)}{\varepsilon}$$

error: $O(\varepsilon)$

0.01