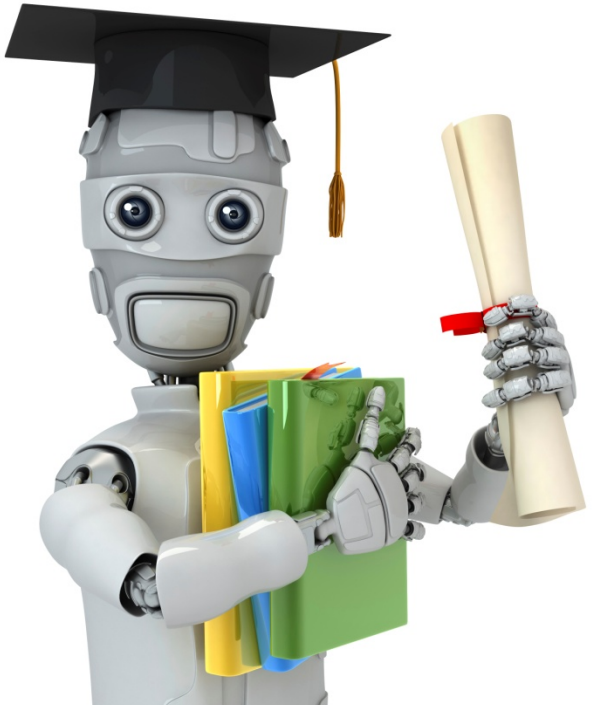


Machine Learning

Linear regression with one variable

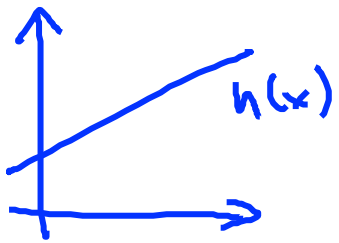
Cost function intuition I

Hypothesis:

$$h_\theta(x) = \theta_0 + \theta_1 x$$

Parameters:

θ_0, θ_1



Cost Function:

$$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

Goal: $\underset{\theta_0, \theta_1}{\text{minimize}}\ J(\theta_0, \theta_1)$

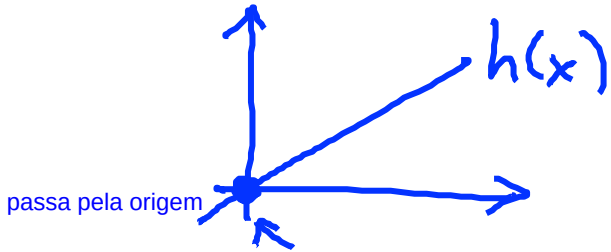
Simplified

para percebermos formula anterior vamos SIMPLIFICAR
imaginemos que x0=0 e x1=x

$$h_\theta(x) = \theta_1 x$$

$\theta_0 = 0$

θ_1



$$J(\theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

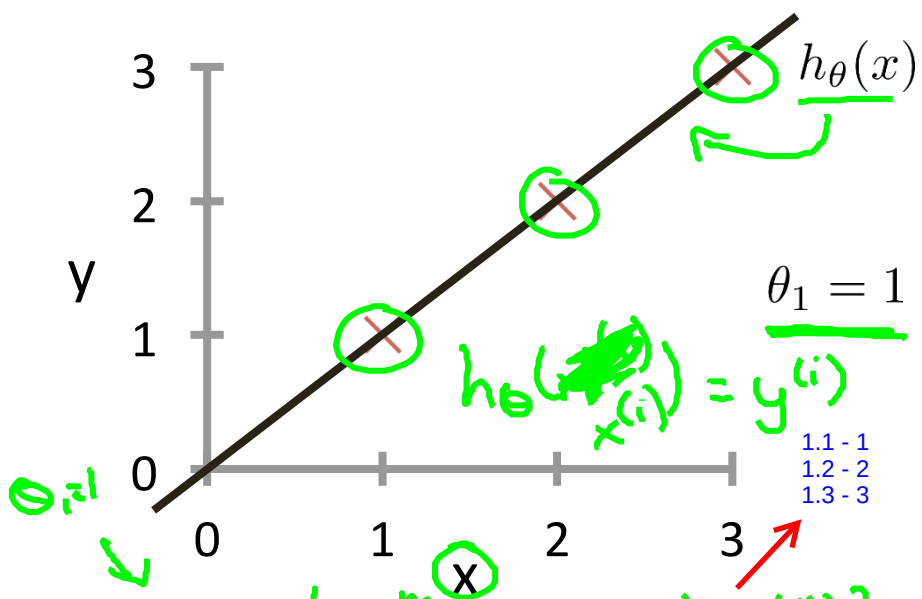
$\theta_1 x^{(i)}$

$\underset{\theta_1}{\text{minimize}}\ J(\theta_1)$

qual é o tamanho da casa x

$h_\theta(x)$

(for fixed θ_1, this is a function of x)



$h_\theta(x^{(i)}) = y^{(i)}$

1.1 - 1
1.2 - 2
1.3 - 3

θ_1

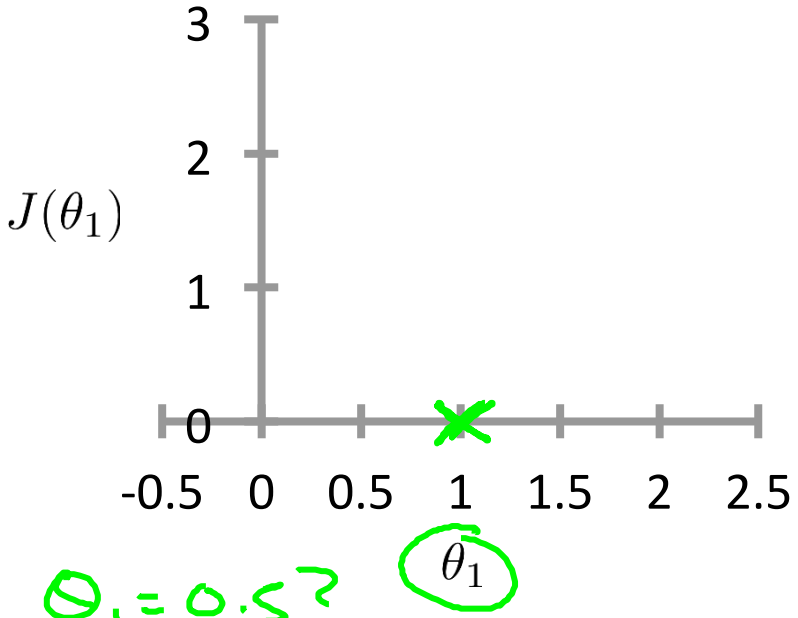
$J(\theta_1) = \frac{1}{2m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)})^2$

$= \frac{1}{2m} \sum_{i=1}^{m} (\theta_1 x^{(i)} - y^{(i)})^2 = \frac{1}{2m}(0^2 + 0^2 + 0^2) = 0^2$

controla a inclinação da linha recta

$J(\theta_1)$

(function of the parameter θ_1)

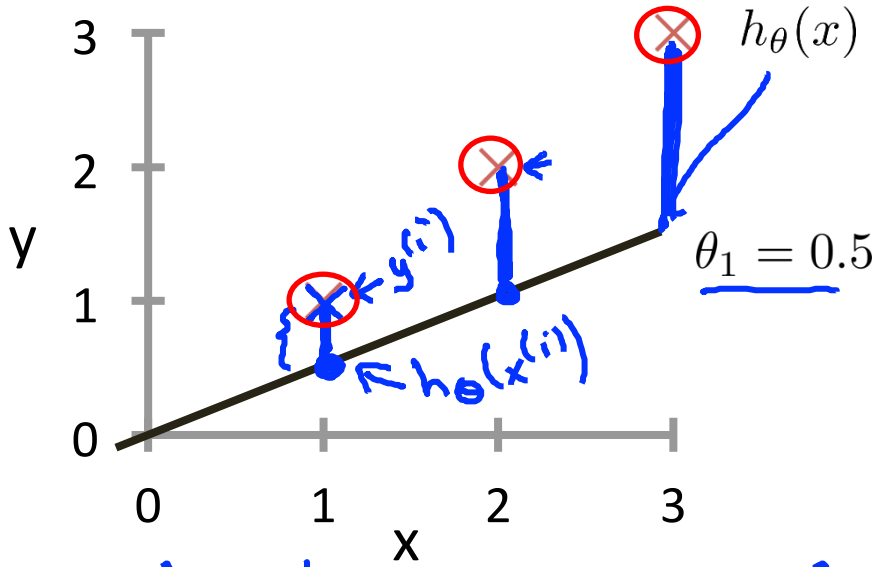


$\theta_1 = 0.5$?

$J(1) = 0$

$h_\theta(x)$

(for fixed θ_1, this is a function of x)

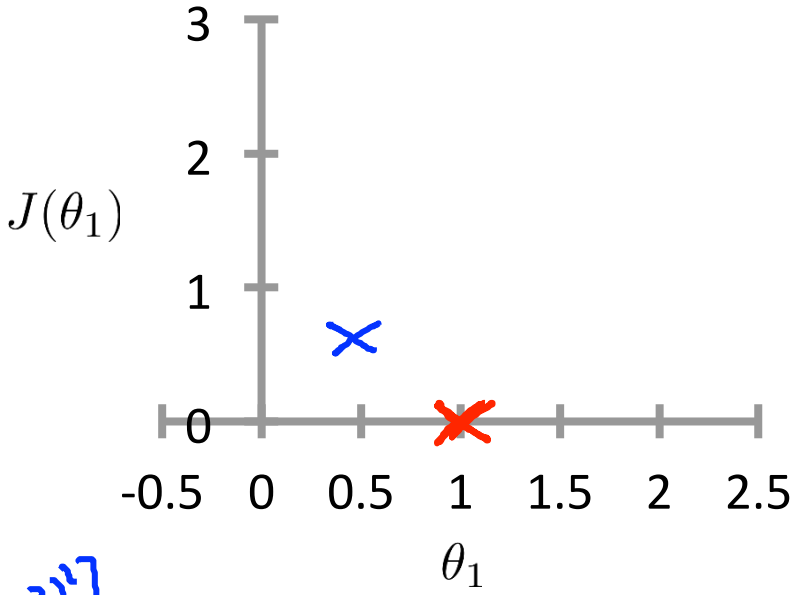


$$J(0.5) = \frac{1}{2m}\left[(0.5-1)^2 + (1-2)^2 + (1.5-3)^2\right]$$

$$= \frac{1}{2\times 3}(3.5) = \frac{3.5}{6} \approx 0.58$$

$J(\theta_1)$

(function of the parameter θ_1)

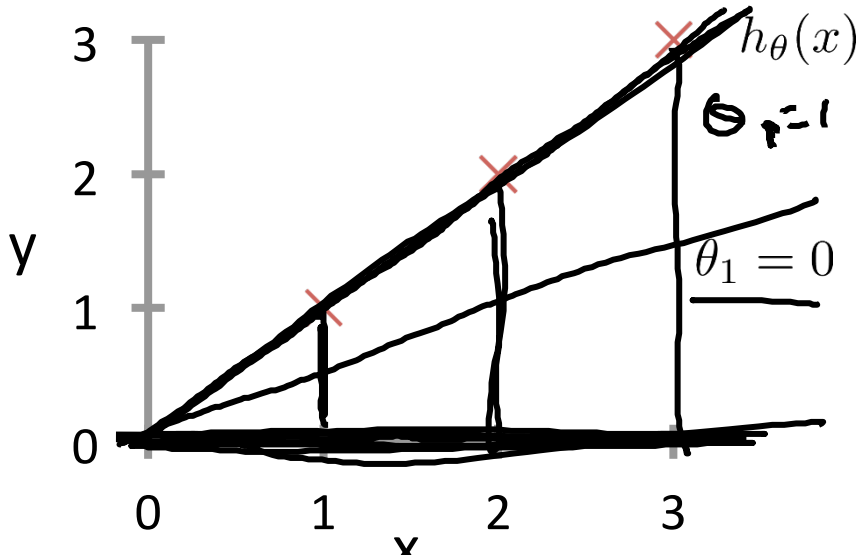


$\theta_1 = 0$?

$J(0) = ?$

$h_\theta(x)$

(for fixed θ_1, this is a function of x)



$J(0) = \frac{1}{2m}(1^2 + 2^2 + 3^2)$

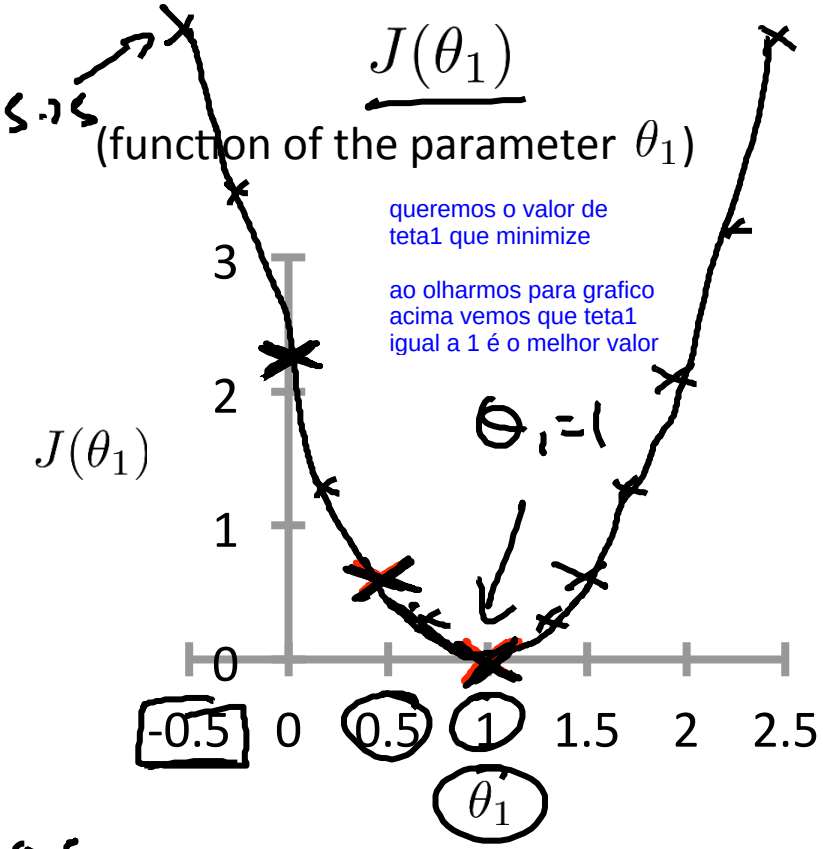
$= \frac{1}{6} \cdot 14 \approx 2.3$

$J(\theta_1)$

(function of the parameter θ_1)

queremos o valor de teta1 que minimize

ao olharmos para grafico acima vemos que teta1 igual a 1 é o melhor valor



$h(x) = -0.5x$

minimize $J(\theta_1)$

θ_1