

**ECO 352:
Homework 1**

Solutions

Problem 2

(a)

$$\begin{aligned} J'(\theta) &= 2\theta a - 2b = 0 \\ \rightarrow \theta^* &= \frac{b}{a} \\ &= \frac{\sum_{i=1}^n y_i x_i}{\sum_{i=1}^n x_i^2} \end{aligned}$$

(b)

$$\begin{aligned} \theta_{k+1} &= \theta_k - \alpha J'(\theta_k) \\ &= \theta_k - 2\alpha[a\theta_k - b] \end{aligned}$$

If $\theta_k > \frac{b}{a}$, we decrease it at the rate 2α and otherwise, we increase it in each iteration.

(c)

$$\begin{aligned} \theta_{k+1} &= \theta_k - \frac{J'(\theta_k)}{J''(\theta_k)} \\ &= \theta_k - \frac{2[a\theta_k - b]}{2a} \\ &= \frac{b}{a} \end{aligned}$$