$$X = \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix} \qquad Y = \begin{bmatrix} 6 \\ 10 \\ 16 \end{bmatrix}$$

$$(SS) = 0 \Rightarrow S$$

$$(RS) = 0 \Rightarrow 2$$

$$\frac{2(RSS)}{2(RSS)} = 0 \Rightarrow 2(6-4i)(-1) + (2)(10-36i)(-3) + (2)(16-64i)(-6$$

920, =264

20,-12 + 180,-60 + 720,-192 = 0

 $\theta_1 = \frac{264}{92} = 2.8695 \cdot N 2.87$

RSS =
$$Z(y_i - y_i)^2$$

RSS = $(6 - \theta_1(1))^2 + (10 - \theta_1(3))^2 + (16 - \theta_1(6))^2$

$$(\theta_0, \theta_1) = (0, 2.87).$$

Fix θ_1
 $\Rightarrow RSS = (6 - (\theta_0 + (2.87)(1)))^2 + (10 - (\theta_0 + (2.87)(1)) + (16 - (\theta_0 + (2.87)(1)))^2)$

$$+2(10-2.87x3-90)(-1)$$

$$+2(16-2.87x6-90)E$$

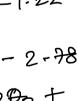
= 600 - 6.6 = 0

to =10)

$$= 2(3.13-0)$$

$$= 20_0 - 6.26$$

$$= 2(3-13-00)(-1) + 2(1-39-00)(-1) + 2(-1-22-00)(-1)$$



$$= 2(3.13-90)(-1) + 2(-1.22-90)(-1)$$

$$= 200 - 6.26 + 200 - 2.78$$

$$(\theta_0,\theta_1) = (1\cdot1, 2\cdot87)$$
. Iteration (1)

put $\theta_0 = 1\cdot1$ (overland)

 $RSS = (6-(1\cdot1+\theta_1(1)))^2 + (10-(1\cdot1+\theta_1(3)))^2 + (16-(1\cdot1+\theta_1(6)))^2 + (16-(1\cdot1+\theta_1(6))^2 + (16-(1\cdot1+\theta_1(6)))^2 + (16-(1\cdot1+\theta_1(6)))^2 + (16-(1\cdot1+\theta_1$

$$+2(16-101-60))(-0).$$

$$=2(0,-4.9)+6(30,-8.9)$$

$$f_{12} (60, -14.9)$$

$$= 20, +180, +720, -9.8 -53.4 - 178.8.$$

$$\theta_1 = 2.63$$
.
 $(\theta_0, \theta_1) = (1.1, 2.63)$

 \Rightarrow 920, = 242

keep 07 = 2-63 Constant.

$$RSS = (6 - (40 + (2.63)(1)))^{2} + (10 - (40 + (2.63)(3)))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3)))^{2} + (16 - (40 + (2.63)(3)))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(3))^{2} + (16 - (40 + (2.63)(4))^{2} + (16 - (40 + (2.63)(4))^{2} + (16 - (40 + (2.63)(4))^{2} + (16 - (40 + (2.63$$

 $(\theta_0, \theta_1) = (1.9, 2.68)$ Iteration (2) keep θ_0 constant $\frac{\partial}{\partial \theta_1} (RSS) = 0 \Rightarrow 92.07 = 2(6-1.9)$ +6(10-1.9)+12(16-1.9)

Do = 1.9

$$(\theta_0,\theta_1) = (1-9, 2.45)$$
.
 $(\theta_0,\theta_1) = (1-9, 2.45)$.

600 = 15

$$\frac{2(RSS)}{200} = 0 \Rightarrow 600 = 2(6 - 2.45)$$

$$+2(10 - 2.45 \times 3)$$

$$+2(16 - 2.45 \times 6)$$

$$\theta_0 = 2.5$$
 $(\theta_0, \theta_1) = (2.5, 2.45)$. Heration 3
$$b) (\theta_0, \theta_1) = (0, 0) \quad k = 0.01$$

$$k = \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix} \quad \forall = \begin{bmatrix} 6 \\ 10 \\ -3 \end{bmatrix} \quad \text{sample order.}$$

random camples
sample (1)
$$\rightarrow$$
 (3,10)
RSS = (10 - ($\theta_0 + \theta_1(3)$))²
 $\frac{3RSS}{3\theta_0} = 2(10 - \theta_0 - \theta_1(3))(-1)$
= -20

$$\frac{\partial RSS}{\partial \Phi_{1}} = 2(10-\Phi_{0}-3\Phi_{1})(-3)$$

$$= -60$$

$$\Phi_{0} = \Phi_{0} - \cancel{2}RSS$$

$$= 0+(0.01)(20)$$

$$= 0.2$$

$$\Phi_{1} = 0-(0.01)(-60) = 0.6$$

$$(\theta_{0}, \theta_{1}) = (0.2, 0.6).$$
Sample (2) (1,6)
$$RSS = (6-(\theta_{0}+\theta_{1}))^{2}$$

$$\frac{\partial RSS}{\partial \Phi_{0}} = 2(6-\theta_{0}-\theta_{1})(-1) = 2(6-0.8)(-1)$$

$$\frac{\partial RSS}{\partial \Phi_{0}} = 2(6-\theta_{0}-\theta_{1})(-1) = 2(6-0.8)(-1)$$

$$= -10.4$$

$$\theta_{0} = \theta_{0} - \cancel{2}RSS$$

$$= 0.2 + (0.01)(10.4)$$

$$\theta_1 = 0.704$$

= 0.304

$$RSS = (16 - (16$$

Sample 3 (6,16)

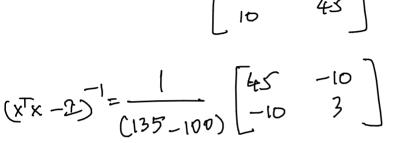
(00,0) = (0.304, 0.704)

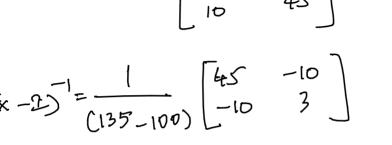
$$x^{T}x - P = \begin{bmatrix} 3 & 10 \\ 10 & 44 \end{bmatrix} - \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 10 \\ 10 & 45 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 10 \\ 10 & 45 \end{bmatrix}$$

$$= \begin{bmatrix} 45 & -10 \\ 10 & 3 \end{bmatrix}$$





$$(-2)^{-1} = \frac{1}{(135^{2} - 100)} \begin{bmatrix} 45 & -10 \\ -10 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 1028 & -0.285 \\ -0.285 & 0.086 \end{bmatrix}$$

$$= \frac{1}{(135-100)} \begin{bmatrix} 45 & -10 \\ -10 & 3 \end{bmatrix}$$

 $\begin{bmatrix} 1 & 0.428 & -0.428 \\ -0.2 & -0.028 & 0.2286 \end{bmatrix} \leftarrow (x^{T}x - 2) x^{T}$

 $\theta = \begin{bmatrix} 3.428 \\ 2.1714 \end{bmatrix}$

$$= \begin{bmatrix} 3 & 10 \\ 10 & 45 \end{bmatrix}$$

$$= \begin{bmatrix} -1 & -10 \\ -10 & 3 \end{bmatrix}$$