

Question 1 :

Linear regression model.

$$\hat{y} = \theta_1 x + \theta_0$$

Loss function: $L = \frac{1}{2m} \sum_{i=1}^m (\hat{y}_i - y_i)^2$

sn	x	y	\hat{y}	$\hat{y} - y$
1	35	720	675	-45
2	28	650	640	-10
3	45	750	725	-25
4	31	600	655	+55
5	52	780	760	-20
6	29	630	645	+15
7	42	710	710	0
8	33	640	665	25

$$L = \frac{1}{2 \cdot 8} \sum_{i=1}^8 (\hat{y}_i - y_i)^2 = 499,0625$$

After 1 iteration, parameter update:

$$\theta_1' = \theta_1 - \eta \frac{dL}{d\theta_1} = \theta_1 - \eta \frac{dL}{d\hat{y}} \cdot \frac{d\hat{y}}{d\theta_1} = \theta_1 - \eta \left[\frac{1}{m} \sum_{i=1}^m (\hat{y}_i - y_i) \cdot x_i \right]$$

$$= 5 - 0,01 \left[\frac{1}{8} \sum_{i=1}^8 ((\hat{y}_i - y_i) \cdot x_i) \right] = 5 - 4,875 = 0,125$$

$$\theta_0' = \theta_0 - \eta \frac{dL}{d\theta_0} = \theta_0 - \eta \frac{dL}{d\hat{y}} \cdot \frac{d\hat{y}}{d\theta_0} = \theta_0 - \eta \left[\frac{1}{m} \sum_{i=1}^m (\hat{y}_i - y_i) \right]$$

$$= 500 - 0,01 \left[\frac{1}{8} \sum_{i=1}^8 (\hat{y}_i - y_i) \right] = 500,00625$$

Then θ_0 increases slightly, and θ_1 increases significantly