#1

a) I used the classic method which the minimizers $\hat{\beta}_0$ and $\hat{\beta}_1$ of the function $F(\alpha_0, \alpha_1) = \sum_{n=1}^{N} (y_n - (\alpha_0 + \alpha_1 x_n))^2$ in can be determined by computing the partical derivatives of F and setting them equal to 0.

$N = 3 \qquad (0, 6) \qquad (1, 0) \qquad (0, 0)$

$$\bar{x} = \frac{0+1+0}{3} = \frac{1}{3}$$

$$\bar{y} = \frac{6+0+0}{3} = 2$$

$$\hat{\beta}_0 = \frac{1}{N}\left(\sum_{n=1}^{N} y_n - \hat{\beta}_1 \sum_{n=1}^{N} x_n\right) = \frac{1}{3}\left[(6+0+0) - (-3)(0+1+0)\right]$$

$$= \frac{1}{3}[6 - (-3)]$$

$$= \frac{1}{3} \cdot 9 = 3$$

$$\hat{\beta}_1 = \frac{\sum_{n=1}^{N} (x_n - \bar{x})(y_n - \bar{y})}{\sum_{n=1}^{N} (x_n - \bar{x})^2} = \frac{[(0-\frac{1}{3})(6-2)] + [(1-\frac{1}{3})(0-2)] + [(0-\frac{1}{3})(0-2)]}{(0-\frac{1}{3})^2 + (1-\frac{1}{3})^2 + (0-\frac{1}{3})^2}$$

$$= \frac{-2}{\frac{1}{9} + \frac{4}{9} + \frac{1}{9}}$$

$$= \frac{-2}{\frac{2}{3}} = -3$$

b) The key is the $\hat{\beta}_0$ and $\hat{\beta}_1$ will be always positive. Since we use partical derivatives of F and setting them equal to 0. to get the $\hat{\beta}_0$ and $\hat{\beta}_1$. So we can assume

$$f(\beta_0, \beta_1) = \sum_{n=1}^{N} |\beta_0 + \beta_1 x_n - y_n|$$

$$\begin{cases} \dfrac{\partial(\beta_0, \beta_1)}{\partial \beta_0} = \sum_{n=1}^{N} |1 + \beta_1 x_n - y_n| \\[2ex] \dfrac{\partial(\beta_0, \beta_1)}{\partial \beta_1} = \sum_{n=1}^{N} |\beta_0 + x_n - y_n| \end{cases}$$

So by the system equation we can noticed that whatever X_n or Y_n is, the value of β_0 and β_1 is always positive and we won't have negative intercept which is not make sense.