2)

(c) gradient of $\sum_{i=1}^{50} (y_i - (\omega_0 + \omega_1 x_i))^2$

$$\nabla = \begin{bmatrix} \frac{\partial}{\partial \omega_0} \left(\sum_{i=1}^{50} (y_i - (\omega_0 + \omega_1 x_i))^2 \right) \\ \frac{\partial}{\partial \omega_1} \left(\sum_{i=1}^{50} (y_i - (\omega_0 + \omega_1 x_i))^2 \right) \end{bmatrix}$$

$$= \begin{bmatrix} \sum_{i=1}^{50} \frac{\partial}{\partial \omega_0} (y_i - (\omega_0 + \omega_1 x_i))^2 \\ \sum_{i=1}^{50} \frac{\partial}{\partial \omega_1} (y_i - (\omega_0 + \omega_1 x_i))^2 \end{bmatrix}$$

$$= \begin{bmatrix} \sum_{i=1}^{50} 2 \cdot (y_i - (\omega_0 + \omega_1 x_i)) \cdot (0 - 1 - 0) \\ \sum_{i=1}^{50} 2 \cdot (y_i - (\omega_0 + \omega_1 x_i)) \cdot (0 - 0 - x_i) \end{bmatrix}$$

$$= -2 \cdot \sum_{i=1}^{50} \begin{bmatrix} (y_i - (\omega_0 + \omega_1 x_i)) \\ (y_i - (\omega_0 + \omega_1 x_i)) x_i \end{bmatrix}$$

$$\nabla = -2 \cdot \sum_{i=1}^{50} (y_i - (\omega_0 + \omega_1 x_i)) \cdot \begin{bmatrix} 1 \\ x_i \end{bmatrix}$$