$$\min S = \min \sum_{i=1}^{n} (ax_i^2 + bx_i + c - y_i)^2 \tag{1}$$

$$\frac{\partial S}{\partial a} = \sum_{i=1}^{n} \cancel{2}(ax_i^2 + bx_i + c - y_i)x_i^2 = 0 \tag{2}$$

$$\frac{\partial S}{\partial b} = \sum_{i=1}^{n} \cancel{2}(ax_i^2 + bx_i + c - y_i)x_i = 0 \tag{3}$$

$$\frac{\partial S}{\partial c} = \sum_{i=1}^{n} \cancel{2}(ax_i^2 + bx_i + c - y_i) = 0 \tag{4}$$

$$\frac{\partial S}{\partial a} = \sum_{i=1}^{n} (ax_i^2 + bx_i + c)x_i^2 - \sum_{i=1}^{n} x_i^2 y_i = 0 \tag{5}$$

$$\frac{\partial S}{\partial b} = \sum_{i=1}^{n} (ax_i^2 + bx_i + c)x_i - \sum_{i=1}^{n} x_i y_i = 0 \tag{6}$$

$$\frac{\partial S}{\partial c} = \sum_{i=1}^{n} (ax_i^2 + bx_i + c) - \sum_{i=1}^{n} y_i = 0 \tag{7}$$

$$\frac{\partial S}{\partial a} = a\sum_{i=1}^{n} ax_i^4 + b\sum_{i=1}^{n} x_i^3 + c\sum_{i=1}^{n} x_i^2 = \sum_{i=1}^{n} x_i^2 y_i \tag{8}$$

$$\frac{\partial S}{\partial b} = a\sum_{i=1}^{n} ax_i^3 + b\sum_{i=1}^{n} x_i^2 + c\sum_{i=1}^{n} x_i = \sum_{i=1}^{n} x_i y_i \tag{9}$$

$$\frac{\partial S}{\partial c} = a\sum_{i=1}^{n} ax_i^2 + b\sum_{i=1}^{n} x_i + cn = \sum_{i=1}^{n} y_i \tag{10}$$

$$\begin{bmatrix} \sum_{i=1}^{n} x_i^4 & \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^2 \\ \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i \\ \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i & n \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} x_i^2 y_i \\ \sum_{i=1}^{n} x_i y_i \\ \sum_{i=1}^{n} y_i \end{bmatrix} \quad (11)$$