6. $\chi^2(a_0, a_1) = \sum_{i=1}^{n} (y_i - (a_0 + a_1 x_i))^2$

$$\frac{\partial \chi^2}{\partial a_0} = \sum_{i=1}^{n} 2(y_i - (a_0 + a_1 x_i)) \cdot (-1)$$

$$= -2\left[\sum_{i=1}^{n} y_i - \sum_{i=1}^{n} a_0 - \sum_{i=1}^{n} a_1 x_i\right] = 0$$

$$\rightarrow \sum_{i=1}^{n} a_0 = n a_0 = \sum_{i=1}^{n} y_i - a_1 \sum_{i=1}^{n} x_i$$

$$\rightarrow a_0 = \frac{1}{n}\sum_{i=1}^{n} y_i - \frac{a_1}{n}\sum_{i=1}^{n} x_i = \bar{y} - a_1 \bar{x}$$

$$\frac{\partial \chi^2}{\partial a_1} = \sum_{i=1}^{n} 2(y_i - (a_0 + a_1 x_i))(-x_i)$$

$$= -2\left[\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} a_0 x_i - \sum_{i=1}^{n} a_1 x_i^2\right] = 0$$

$$\rightarrow a_1 \sum_{i=1}^{n} x_i^2 = \sum_{i=1}^{n} x_i y_i - (\bar{y} - a_1 \bar{x}) \sum_{i=1}^{n} x_i$$

$$\rightarrow a_1 \left(\sum_{i=1}^{n} x_i^2 - \bar{x} \sum_{i=1}^{n} x_i\right) = \sum_{i=1}^{n} x_i y_i - \frac{1}{n}\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i$$

$$a_1 \left(\sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2\right) = \sum_{i=1}^{n} x_i y_i - \frac{1}{n}\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i$$

$$a_1 = \frac{\sum_{i=1}^{n} x_i y_i - \frac{1}{n}\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i}{\sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2}$$

$$\frac{\partial X^2}{\partial a_0} = \sum_{i=1}^{n} (-2)(y_i - (a_0 + a_1 x_i + a_2 x_i^2)) = 0$$

$$\rightarrow \sum_{i=1}^{n} (y_i - (a_0 + a_1 x_i + a_2 x_i^2)) = 0$$

$$\sum_{i=1}^{n} (a_0 + a_1 x_i + a_2 x_i^2) = \sum_{i=1}^{n} y_i$$

$$n a_0 + a_1 \sum_{i=1}^{n} x_i + a_2 \sum_{i=1}^{n} x_i^2 = \sum_{i=1}^{n} y_i$$

$$\frac{\partial X^2}{\partial a_1} = \sum_{i=1}^{n} (-2)(y_i - (a_0 + a_1 x_i + a_2 x_i^2))(x_i) = 0$$

$$\rightarrow \sum_{i=1}^{n} (x_i y_i - (a_0 x_i + a_1 x_i^2 + a_2 x_i^3)) = 0$$

$$\sum_{i=1}^{n} (a_0 x_i + a_1 x_i^2 + a_2 x_i^3) = \sum_{i=1}^{n} x_i y_i$$

$$a_0 \sum_{i=1}^{n} x_i + a_1 \sum_{i=1}^{n} x_i^2 + a_2 \sum_{i=1}^{n} x_i^3 = \sum_{i=1}^{n} x_i y_i$$

$$\frac{\partial X^2}{\partial a_2} = \sum_{i=1}^{n} (-2)(y_i - (a_0 + a_1 x_i + a_2 x_i^2))(x_i^2) = 0$$

$$\rightarrow \sum_{i=1}^{n} (x_i^2 y_i - (a_0 x_i^2 + a_1 x_i^3 + a_2 x_i^4)) = 0$$

$$\sum_{i=1}^{n} (a_0 x_i^2 + a_1 x_i^3 + a_2 x_i^4) = \sum_{i=1}^{n} x_i^2 y_i$$

$$a_0 \sum_{i=1}^{n} x_i^2 + a_1 \sum_{i=1}^{n} x_i^3 + a_2 \sum_{i=1}^{n} x_i^4 = \sum_{i=1}^{n} x_i^2 y_i$$