6.

$$\frac{\partial \chi^2}{\partial a_0} = \sum_i \frac{\partial}{\partial a_0}\left[(y_i - (a_i x_i + a_0))^2\right]$$

$$\sum_i (y_i - (a_i x_i + a_0)) = 0$$

$$\sum_i y_i - \sum_i d_i x_i - \sum_i^{n} a_0 = 0$$

$$\sum y_i - a_i \sum_i x_i - N a_0 = 0$$

$$\bar{y} - a_i \bar{x} - a_0 = 0$$

$$a_0 = \bar{y} - a_1 \bar{x}$$

$$\frac{\partial \chi^2}{\partial a_i} = \sum_i \frac{\partial}{\partial a_i}\left[(y_i - (a_i x_i + a_0))^2\right] = 0$$

$$\Rightarrow \sum_i 2\,(y_i - (a_i x_i + a_0))\,(-x_i) = 0$$

$$= \sum_i y_i x_i \quad a_i \sum_i x_i^2 + a_0 \sum_i x_i = 0$$

$$-2 \sum x_i y_i + a_i \sum x_i^2 + \left[\frac{1}{N}\sum_i y_i + \frac{a_i}{N}\sum x_i\right]\sum_i x_i = 0$$

$$a_i\left[\sum x_i^2 + \frac{1}{N}\left(\sum_i x_i\right)^2\right] = 2\sum_i x_i y_i + \frac{1}{N}\sum_i x_i \sum_i y_i$$

$$a_i = \frac{2\sum x_i y_i + \frac{1}{N}\sum x_i \sum y_i}{\sum_i x_i^2 + \frac{1}{N}\left(\sum x_i\right)^2}$$

$$\chi^2(a_0, a_1, a_2) = \sum_{i=1}^{N} \left(y_i - (a_0 + a_1 x_i + a_2 x_i^2) \right)^2$$

$$\Rightarrow \frac{\partial \chi^2}{\partial a_0} = \sum \left[\frac{\partial}{\partial a_0} \left[(y_i - (a_0 + a_1 x_i + a_2 x_i^2))^2 \right] \right]$$

$$= \sum \left[2 (y_i - (a_0 + a_1 x_i + a_2 x_i^2)) \cdot 1 \right] = 0$$

$$= \sum_{i=1}^{N} \left[a_0 + a_1 x_1 + a_2 x_i^2 = y_i \right]$$

$* \; x_i \qquad \sum_{i=1}^{N} \left[a_0 x_i + a_1 x_i^2 + a_2 x_i^3 = x_i y_i \right]$

$* \; x_i^2 \qquad \sum_{i=1}^{N} \left[a_0 x_i^2 + a_1 x_i^3 + a_2 x_i^4 = x_i^2 y_i \right]$