Derivadas parciales igualadas a 0

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

$$\frac{\partial \chi^2}{\partial a_0} = -2\sum_{i=1} (y_1 - a_0 - a_1 x_1) = 0$$

$$\sum_{i=1}^{n} y_i = \sum_{i=1}^{n} a_0 + a_1 x_1$$

$$\sum_{i=1} y_1 = a_0 \cdot n + a_1 \sum_{i=1}^{n} x_1$$

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

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

Porque

$$\bar{x} = \sum_{i=1}^{n} \frac{x_i}{n}$$

$$\bar{y} = \sum_{i=1}^{n} \frac{y_i}{n}$$

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

$$= \sum x_i y_1 - x_i a_0 + a_1 x_i^2 = 0$$

$$\sum x_i y_i - a_0 \sum x_i + a_1 \sum x^2 = 0$$

$$\sum x_i y_i - (\bar{y} - a_1 \bar{x}) \sum x_i + a_1 \sum x^2 = 0$$

$$\sum x_i y_1 = \bar{y} \sum_{i=1}^{n} x_i - a_1 \bar{x} \sum_{i=1}^{n} x_i + a_1 \sum_{i=1}^{n} x_i^2$$

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

$$a_1 = \frac{\sum_{i=1}^{n} x_i y_i - \frac{\sum_{i=1}^{n} y \sum_{i=1}^{n} x}{n}}{\sum_{i=1}^{n} x^2 - \frac{\sum x \cdot \sum x}{n}}$$

b) $\chi^2(a_0, a_1, a_2) = \sum_{i=1}^{n} (y_i - (a_0 + a_1 x + a_2 x^2))^2$

$$\frac{\partial \chi^2}{\partial a_1} = \sum -2(y_1 - (a_0 + a_1 x + a_2 x^2))$$

$$0 = \sum \cancel{-2}(y_1 - (a_0 + a_1 x + a_2 x^2)$$

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

$$\frac{\partial \chi^2}{\partial a_2} = -2x(y_1 - (a_0 + a_1 x + a_2 x^2)$$

$$0 = -\cancel{2}x(y_1 - (a_0 + a_1 x + a_2 x^2)$$

$$\sum_{i=1}^{n} x y_1 = (a_0 + a_1 x + a_2 x^2) \cdot x$$

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

$$\frac{\partial \chi^2}{\partial a_3} = -2x^2(y_1 - (a_0 + a_1 \cdot x + a_2 x^2))$$

$$0 = -2x^2(y_1 - (a_0 + a_1 x + a_2 x^2))]$$

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

$$\sum_{i=1}^{n} [a_0 x^2 + a_1 x^3 + a_2 x^4) = x^2 y_i]$$

Respuesta: si hay una Regularidad el sistema de ecuaciones, el coeficiente que acompaña las $[a_0, a_1, a_2]$ es por Regla de la cadena multiplicado por la derivada externa, así que en un $\hat{P(x)}$ habría un

$$\sum_{i=1}^{n} [a_0 \cdot x^n + a_1 \cdot x^{n+1} + a_2 \cdot x^{n+2} \ldots + a_{n+1}] = y_i \cdot x^n$$