Mínimos cuadrados 7 pt 2:

c) $$\frac{\partial \chi^2(\vec{\theta})}{\partial \theta_j} = \frac{\partial}{\partial \theta_j}\left[\sum_{i=1}^{N}\left(\frac{y_i - M(x_i,\vec{\theta})}{\sigma_i}\right)^2\right]$$

por regla de la cadena y como la sumatoria no afecta la derivada...

$$\sum_{i=1}^{N}\frac{\partial}{\partial \theta_j}\left[\left(\frac{y_i - M(x_i,\vec{\theta})}{\sigma_i}\right)^2\right] = \sum_{i=1}^{N}\frac{\partial}{\partial z}(z^2)\cdot\frac{\partial z}{\partial \theta_j} = \sum_{i=1}^{N} 2\cdot z\cdot\frac{\partial z}{\partial \theta_j}$$

$$= \sum_{i=1}^{N} 2\cdot\frac{y_i - M(x_i,\vec{\theta})}{\sigma_i^2}\cdot -1\cdot\frac{\partial M(x_i,\vec{\theta})}{\partial \theta_j}, \quad \sigma_i = 1 \ \forall i$$

$$= -2\sum_{i=1}^{N}\left(y_i - M(x_i,\vec{\theta})\right)\cdot\frac{\partial M(x_i,\vec{\theta})}{\partial \theta_j}$$

~~$\partial\vec{\theta}\,\nabla_\theta\,\chi^2(\vec{\theta}) = 0$~~
~~$\vec{\theta}$ pequeño pero no infinitesimal~~

d) $\underbrace{\nabla_\theta\,\chi^2(\vec{\theta}) = 0}_{\text{Lo ideal}} \rightarrow \underbrace{\min(\chi^2(\vec{\theta}))}_{\text{La realidad}}$

$$\min(\chi^2(\vec{\theta})) \Rightarrow \underline{\nabla_\theta\,\chi^2(\vec{\theta}) = 0}$$

$\underbrace{\partial\vec{\theta}}\,\nabla_\theta\,\chi^2(\vec{\theta}) = \vec{\theta}_f - \vec{\theta}_i$, $\vec{\theta}_i = \vec{\theta}$ que logra $\nabla_\theta\,\chi(\vec{\theta}) = 0$

$\vec{\theta}$ muy pequeño no infinitesimal

$$\partial\vec{\theta}\,\nabla_\theta\,\chi^2(\vec{\theta}) - \vec{\theta}_f = -\vec{\theta}_i \rightarrow \vec{\theta}_f - \partial\vec{\theta}\,\nabla_\theta\,\chi^2(\vec{\theta}) = \vec{\theta}_i$$

realmente, empezamos con un $\vec{\theta}_f$ que no minimiza $\nabla_\theta\,\chi^2(\vec{\theta}) = 0$ y un $\partial\theta \neq 0$. Con esto no obtenemos $\vec{\theta}_i$ de un salto, así que iteramos. Con las iteraciones quedamos con la formula:

$$\underline{\vec{\theta}_{j+1} = \vec{\theta}_j - \gamma\left(-2\sum_{i=1}^{N}(y_i - M(x_i,\vec{\theta}))\,\nabla_\theta M(x_i,\vec{\theta}_j)\right)}$$