C. Tenemos que

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

$$\sigma = 1$$

Por tanto

$$= \sum_{i=1}^{N}(y_i - M(x_i, \theta))^2$$

Ahora si derivamos tenemos lo siguiente

$$\frac{\partial \chi^2(\vec{\theta})}{\partial \theta_i} = \frac{d}{d\theta_i}(y_i - M(x_i, \vec{\theta}))^2$$

$$= -2(y_i - M(x_i, \theta)) \cdot \left(\frac{\partial M(x_i, \vec{\theta})}{\partial \theta_i}\right)$$

$$\frac{\partial \chi^2(\vec{\theta})}{\partial \theta_i} = -2\sum_{i=1}^{N}(y_i - M(x_i, \vec{\theta}))\frac{\partial M(x_i, \vec{\theta})}{\partial \theta_i}$$ //Rta

D. Segun sabemos el descenso del gradiente se define como:

$$\vec{X}_{j+1} = \vec{X}_{j} - \gamma \nabla \vec{F}(\vec{X}_j) \quad y \quad \nabla F(x_j) = \frac{\partial \chi^2(\vec{\theta})}{\partial \theta_i}$$

Sabiendo lo anterior, solo queda calcular la derivada de:

$$\frac{\partial M(x_i, \vec{\theta})}{\partial \theta_i} = \nabla_\theta M(x_i, \vec{\theta})$$

Por tanto:

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