d) Muestre que vectorialmente, el descenso del gradiente queda definido por:

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

Teniendo que la formula del gradiente es

$$x_1 = x_0 - \alpha \nabla_x f(x_0) \rightarrow x_{n+1} = x_n - \alpha \nabla_x f(x_n)$$

Tomo la funcion de punto c es decir $x^2(\vec{\theta})$ y aplicamos para hallar su gradiente

$$\nabla_\theta x^2(\vec{\theta}) = \left[-2 \sum_{i=1}^{N} (y_i - M(x_i, \vec{\theta}_0)) \frac{\partial M(x_i, \vec{\theta})}{\partial \theta_0}, -2 \sum_{i=1}^{N} (y_i - M(x_i, \vec{\theta}_1)) \frac{\partial M(x_i, \vec{\theta}_1)}{\partial \theta_1}, -2 \sum_{i=1}^{N} (y_i - M(x_i, \vec{\theta}_2)) \frac{\partial M(x_i, \theta)}{\partial \theta_2}\right]$$

Teniendo

$$\nabla_\theta x^2(\theta) = -2 \sum_{i=1}^{N} (y_i - M(x_i, \vec{\theta}_j)) \nabla_\theta M(x_i, \theta_j))$$

Donde

$$\nabla_\theta M(x_i, \vec{\theta}_j) = \left[\frac{\partial M(x_i, \vec{\theta})}{\partial \theta_0}, \frac{\partial M(x_i, \vec{\theta})}{\partial \theta_1}, \frac{\partial M(x_i, \vec{\theta})}{\partial \theta_2}\right]$$

Quedando demostrado que el descenso del gradiente da

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