Gradient Descent — Jashaina Thomas

$$l(\theta) = \log[L(\theta)] = \frac{1}{m}\sum_{1}^{m}(h\theta(x^{(i)}) - y^{(i)})^2$$

$$\frac{\partial}{\partial\theta_0}[l(\theta_0,\theta_1)] = \frac{\partial}{\partial\theta_0}\left(\frac{1}{m}\sum_{1}^{m}(h\theta(x^{(i)}) - y^{(i)})^2\right) = \frac{1}{m}\sum_{1}^{m}\frac{\partial}{\partial\theta_0}(h\theta(x^{(i)}) - y^{(i)})^2$$

$$= \frac{1}{m}\sum_{1}^{m} 2(h\theta(x^{(i)}) - y^{(i)})\frac{\partial}{\partial\theta_0}(h\theta(x^{(i)}) - y^{(i)})$$

$$= \frac{2}{m}\sum_{1}^{m}(h\theta(x^{(i)}) - y^{(i)})\frac{\partial}{\partial\theta_0}(\theta_0 + \theta_1 x^{(i)} - y^{(i)}) = \frac{2}{m}\sum_{1}^{m}(h\theta(x^{(i)}) - y^{(i)})$$

$$l(\theta) = \frac{1}{2}\sum_{1}^{m}(h\theta(x^{(i)}) - y^{(i)})^2$$

$$\frac{\partial}{\partial\theta_j}[l(\theta)] = \frac{\partial}{\partial\theta_j}\frac{1}{2}(h\theta(x) - y)^2 = \frac{1}{2}(2)(h\theta(x) - y)\frac{\partial}{\partial\theta_j}(h\theta(x) - y)$$

$$= (h\theta(x) - y)\frac{\partial}{\partial\theta_j}\left(\sum_{0}^{m}\theta_i x_i - y\right) = (h\theta(x) - y)x_j$$

$$\therefore \theta_j := \theta_j + \alpha(y^i - h\theta(x^i))x_j^{(i)} \quad \checkmark$$