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$$h(x)\theta = 4\theta_1 x_1^7 x_2^5 + \theta_2 x_2^3 - \theta_2\theta_3 x_2^4 + \theta_0$$

$$J(\theta_0,\theta_1,\theta_2,\theta_3) = \frac{1}{2}(y^{(i)} - h_\theta(x^{(i)}))^2$$

Q1

(1) $\frac{\partial j}{\partial \theta_0} = \frac{2}{2}(y^i - h_\theta(x^i)) \cdot \frac{\partial h_\theta(x)}{\partial \theta_0}$

$= (y^i - h_\theta(x^i))$

(2) $\frac{\partial j}{\partial \theta_1} = \frac{2}{2}(y^i - h_\theta(x^i)) \cdot \frac{\partial h_\theta(x)}{\partial \theta_1}$

$= (y^i - h_\theta(x^i)) * 4x_1^2 * x_2^5$

(3) $\frac{\partial j}{\partial \theta_2} = \frac{2}{2}(y^i - h_\theta(x^i)) \cdot x_2^3$

(4) $\frac{\partial j}{\partial \theta_3} = \frac{2}{2}(y^i - h_\theta(x^i)) \cdot (x_2^4 - \theta_2)$

(5) : $\theta_j = \theta_j - \alpha \frac{\partial j}{\partial \theta_j}$

$\theta_3^{new} = \theta_3 - \alpha \cdot (-\theta_2 \cdot x_2^4 (y^i - h_\theta(x^i)))$

$= \theta_3 + \alpha\theta_2 x_2^4 (y^i - (4\theta_1 x_1^2 x_2^5 + \theta_2 x_2^3 - \theta_2\theta_3 x_2^4 + \theta_0))$