$$\nabla E = \frac{dE}{dW} = \frac{dE}{d[w_0\ w_1\ w_2\ w_3]^T} \text{ is computed as,}$$

$$= \left[\frac{\partial E}{\partial w_0}\ \frac{\partial E}{\partial w_1}\ \frac{\partial E}{\partial w_2}\ \frac{\partial E}{\partial w_3}\right]^T.$$

i.e, ∇E is a vector of the partial differential of E with respect to the weights. So, we have to find $\frac{\partial E}{\partial w_0}, \frac{\partial E}{\partial w_1}, \ldots$ and put the results back in the above equations.

$$E = \frac{1}{2}\sum_{i=1}^{m}(y^{(i)} - \hat{y}^{(i)})^2$$

Because, $\hat{y}^{(i)} = w_0 + w_1 x_1^{(i)} + w_2 x_2^{(i)} + w_3 x_3^{(i)}$

$$E = \frac{1}{2}\sum_{i=1}^{m}(y^{(i)} - w_0 - w_1 x_1^{(i)} - w_2 x_2^{(i)} - w_3 x_3^{(i)})^2$$

$$\frac{\partial E}{\partial w_0} = \frac{\partial}{\partial w_0}\left[\frac{1}{2}\sum_{i=1}^{m}(y^{(i)} - w_0 - w_1 x_1^{(i)} - w_2 x_2^{(i)} - w_3 x_3^{(i)})^2\right]$$

$$= 2 \times \frac{1}{2}\sum_{i=1}^{m}(y^{(i)} - w_0 - w_1 x_1^{(i)} - w_2 x_2^{(i)} - w_3 x_3^{(i)}) \cdot \frac{\partial}{\partial w_0}[y^{(i)} - w_0 - w_1 x_1^{(i)} - w_2 x_2^{(i)} - w_3 x_3^{(i)}]$$

Because, we are differentiating wrt w_0, so

$$\frac{\partial}{\partial w_0} y^{(i)} = \frac{\partial}{w_0} w_1 x_1^{(i)} = \frac{\partial w_2 x_2^{(i)}}{\partial w_0} = \frac{\partial}{w_0} w_3 x_3^{(i)} = 0$$

and $\frac{\partial w_0}{\partial w_0} = 1$