HW 2 - Sami

1) $$\mathcal{L}(w) = \sum_{i=1}^{N} \log\left(1 + \exp(x_i^T w)\right) - y_i x_i^T w$$

$$\frac{\partial \mathcal{L}(w)}{\partial w} = \sum_{i=1}^{N} \frac{\partial}{\partial w} \log\left(1 + \exp(x_i^T w)\right) - \frac{\partial}{\partial w} y_i x_i^T w$$

$$= \sum_{i=1}^{N} \frac{\frac{\partial}{\partial w}\left(1 + \exp(x_i^T w)\right)}{1 + \exp(x_i^T w)} - y_i x_i^T \frac{\partial w}{\partial w}$$

$$= \sum_{i=1}^{N} \frac{0 + \exp(x_i^T w) * x_i^T \frac{\partial}{\partial w} w}{1 + \exp(x_i^T w)} - y_i x_i^T$$

$$= \sum_{i=1}^{N} \frac{x_i^T \exp(x_i^T w)}{1 + \exp(x_i^T w)} - y_i x_i^T$$

$$= \sum_{i=1}^{N} x_i^T h(x_i^T) - y_i x_i^T$$