Dummy	GPA	GRE	Y
1	1	1	1
1	0.9	1	1
1	0.9	0.875	1
1	0.7	0.75	-1
1	0.6	0.875	-1

1 $\vec{w} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

$$\nabla_E(\vec{w}) = -\frac{1}{5}\sum_{k=1}^{5} \frac{y_k \vec{x}_k}{1 + e^{y_k \vec{w}^T \vec{x}_k}}$$

$$= -\frac{1}{5}\left[\left(\frac{1 \cdot \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}}{1 + e^{1 \cdot [0\ 0\ 0]\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}}} \right) + \left(\frac{1 \cdot \begin{bmatrix} 1 \\ 0.9 \\ 1 \end{bmatrix}}{1 + e^{1 \cdot 0}} = \frac{}{2} \right) \right.$$

$$+ \left(\frac{1 \cdot \begin{bmatrix} 1 \\ 0.9 \\ 0.875 \end{bmatrix}}{1 + e^{0}} = \frac{}{2} \right) + \left(\frac{-1 \cdot \begin{bmatrix} 1 \\ 0.7 \\ 0.75 \end{bmatrix}}{1 + e^{0}} = \frac{}{2} \right)$$

$$\left. + \left(\frac{-1 \cdot \begin{bmatrix} 1 \\ 0.6 \\ 0.875 \end{bmatrix}}{1 + e^{0}} = \frac{}{2} \right) \right]$$

$$= -\frac{1}{5}\left(\begin{bmatrix} 0.5 \\ 0.5 \\ 0.5 \end{bmatrix} + \begin{bmatrix} 0.5 \\ 0.45 \\ 0.5 \end{bmatrix} + \begin{bmatrix} 0.5 \\ 0.45 \\ 0.4375 \end{bmatrix} - \begin{bmatrix} 0.5 \\ 0.3 \\ 0.375 \end{bmatrix} \right.$$

$$\left. - \begin{bmatrix} 0.5 \\ 0.3 \\ 0.4375 \end{bmatrix} \right)$$

$$= -\frac{1}{5}\begin{bmatrix} 0.5 \\ 0.75 \\ 0.625 \end{bmatrix} = \begin{bmatrix} -0.1 \\ -0.15 \\ -0.125 \end{bmatrix}$$

$$\vec{w} \leftarrow \vec{w} - k \nabla_E(\vec{w}) \quad , \quad \underline{k = 2}$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} - 2\begin{bmatrix} -0.1 \\ -0.15 \\ -0.125 \end{bmatrix} = \begin{bmatrix} 0.2 \\ 0.3 \\ 0.25 \end{bmatrix}$$

After the first iteration,

$$\vec{w} = \begin{bmatrix} 0.2 \\ 0.3 \\ 0.25 \end{bmatrix}$$