Q3) $W^{(1)} = \begin{bmatrix} 2 & 1 \\ 0 & -1 \end{bmatrix}$ $W^{(2)} = \begin{bmatrix} -1 & 2 \\ 1 & 2 \end{bmatrix}$ $X = [1 \quad 2]$ $T = [0 \quad 0]$.

$$\frac{\partial L}{\partial W^{(2)}} = Y^{(2)T} \times (Y^{(3)} - T) \odot f'(Relu^{(2)})$$

$$= \begin{bmatrix} 2 \\ 0 \end{bmatrix} \times [0 \quad 4] \odot [0 \quad 1]$$

$$\boxed{\frac{\partial L}{\partial W^{(2)}} = \begin{bmatrix} 0 & 8 \\ 0 & 0 \end{bmatrix}}$$

$$\frac{\partial L}{\partial W^{(1)}} = X^T \times (Y^{(3)} - T) \odot f'(Relu^{(3)}) \times W^{(2)T} \odot f'(Relu^{(2)})$$

$$= \begin{bmatrix} 1 \\ 2 \end{bmatrix} \times [0 \quad 4] \odot [0 \quad 1] \times \begin{bmatrix} -1 & 1 \\ 2 & 2 \end{bmatrix} \odot \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}.$$

$$= \begin{bmatrix} 1 \\ 2 \end{bmatrix} \times [0 \quad 4] \times \begin{bmatrix} -1 & 0 \\ 2 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ 2 \end{bmatrix} \times \begin{bmatrix} 8 & 0 \end{bmatrix}$$

$$\boxed{\frac{\partial L}{\partial W^{(1)}} = \begin{bmatrix} 8 & 0 \\ 16 & 0 \end{bmatrix}}$$