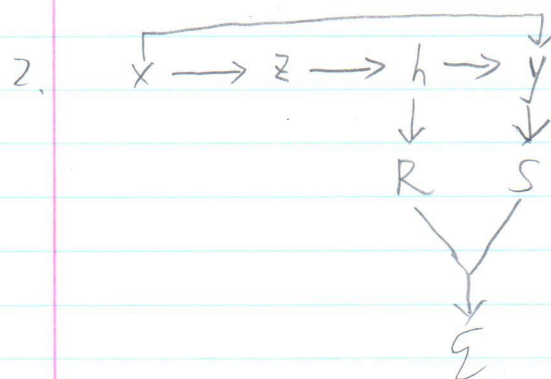


$$1. W = \begin{bmatrix} 1 & -1 & 0 & 0 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$

$$b = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$W = \begin{bmatrix} -1 \\ -1 \\ -1 \end{bmatrix}$$

$$b = 0$$



$$\bar{\epsilon} = 1$$

$$\bar{r} = \bar{\epsilon} \cdot 1 \quad \bar{s} = \bar{\epsilon} \cdot 1$$

$$\bar{y} = \bar{s} \cdot (y - s)$$

$$\bar{h} = (W^{(2)})^T \bar{y} + r \bar{r}$$

$$\bar{z} = \sigma'(z) \bar{h}$$

$$\bar{x} = (W^{(1)})^T \bar{z} + 1_{N \times N} (y - s)$$

$$\bar{x} = (W^{(1)})^T (\sigma'(z)) ((W^{(2)})^T (y - s) + r) + 1_{N \times N} (y - s)$$

$$3. y = w_1 h_1 + w_5 h_2$$

$$h_1 = \text{ReLU}(w_2 h_3 + h_4)$$

$$h_2 = \text{ReLU}(w_4 h_3 + h_4)$$

$$h_3 = \text{ReLU}(w_3 x_1 + x_2)$$

$$h_4 = \text{ReLU}(x_1 + x_2)$$

$$\boxed{h_1 = 0 \quad h'_1 = 0}$$

$$\frac{\partial L}{\partial w_1} = (w_1 h_1 + w_5 h_2 - t) \cdot h_1$$

$$= 0$$

Yes

$$\frac{\partial L}{\partial w_2} = (w_1 \text{ReLU}(w_2 h_3 + h_4) + w_5 h_2) \cdot w_1 \text{ReLU}'(w_2 h_3 + h_4) \cdot h_3$$

$$= 0$$

Yes

$$\begin{aligned}\frac{\partial L}{\partial w_3} &= (w_1 h_1 + w_5 h_2)(w_1 h_1' + w_5 h_2')(w_2 h_3' + w_4 h_3') 2x_1 \\ &= w_5 h_2 \cdot w_5 h_2' (w_2 h_3' + w_4 h_3') 2x_1 \quad \boxed{No}\end{aligned}$$