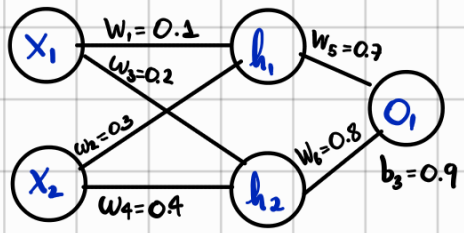
Question #3



$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}^T = [0.3 \; 0.7]$$

$$W_1 = \begin{bmatrix} w_1 & w_2 \\ w_3 & w_4 \end{bmatrix} = \begin{bmatrix} 0.1 & 0.2 \\ 0.3 & 0.4 \end{bmatrix}$$

$$B_1 = [b_1 \; b_2] = [0.5 \; 0.6]$$

$$W_2 = \begin{bmatrix} w_5 \\ w_6 \end{bmatrix} = \begin{bmatrix} 0.7 \\ 0.8 \end{bmatrix}$$

$$B_2 = [b_3] = [0.9]$$

θ_{ij}, i is the # of the hidden unit and j is # of the input

h_i, i is the # of the hidden unit

$$h_d = a\left[\theta_{do} + \sum_{i=1}^{D_i (\#\text{ inputs})} \theta_{di} x_i\right], \quad y_j = \phi_{jo} + \sum_{d=1}^{D} \phi_{jd} h_d$$

$$h_1 = a[\theta_{10} + \theta_{11} x_1 + \theta_{21} x_2]$$

$$h_2 = a[\theta_{20} + \theta_{21} x_1 + \theta_{22} x_2]$$

$$y_0 = \phi_{10} + \phi_{01} h_1 + \phi_{02} h_2$$

So, $h_1 = a[b_1 + w_1 x_1 + w_2 x_2]$

$h_2 = a[b_2 + w_3 x_1 + w_4 x_2]$

$h_1 = a[0.5 + 0.1 \cdot 0.3 + 0.3 \cdot 0.7] = a[0.74]$

$\Rightarrow$

$h_2 = a[0.6 + 0.2 \cdot 0.3 + 0.4 \cdot 0.7] = a[0.94]$

$\Rightarrow h_1 = \frac{1}{1+e^{-0.74}} \simeq 0.677$

$h_2 = \frac{1}{1+e^{-0.94}} \approx 0.719$

So,

$O_0 = a[y_0] = a[\phi_{10} + \phi_{01} h_1 + \phi_{02} h_2]$

$\Rightarrow y_0 = b_3 + w_5 h_1 + w_6 \cdot h_2 = 0.9 + 0.7 \cdot (0.677) + 0.8(0.719)$

$\Rightarrow y_0 = 1.941$

$O_0 = a[1.941] = \frac{1}{1+e^{-1.941}} \approx 0.874$

$error = \frac{1}{2}(0.879 - 1)^2 \approx 0.00788$ //