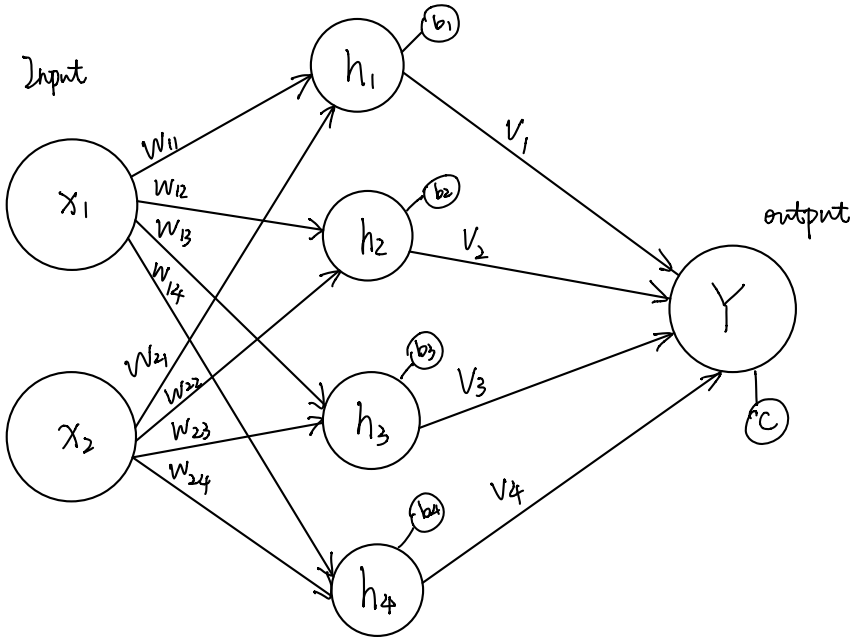
Q 1.1



Q 1.2

$$h_1 = \max(0,\ w_{11}x_1 + w_{21}x_2 + b_1)$$

$$h_2 = \max(0,\ w_{12}x_1 + w_{22}x_2 + b_2)$$

$$h_3 = \max(0,\ w_{13}x_1 + w_{23}x_2 + b_3)$$

$$h_4 = \max(0,\ w_{14}x_1 + w_{24}x_2 + b_4)$$

$$y = \text{Sigmoid}(v_1h_1 + v_2h_2 + v_3h_3 + v_4h_4 + c)$$

Q2.1

$$f_x(x,y) = -3x^2 + 100x - 200y^2$$

$$f_y(x,y) = 800y^3 - 400xy$$

Q3.1

$$L = -y_i \log(\hat{y}_i) - (1-y_i)\cdot\log(1-\hat{y}_i)$$

$$\frac{\partial L}{\partial c} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)\cdot\frac{e^{-z}}{(1+e^{-z})^2}$$

$$\frac{\partial L}{\partial v_j} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)\cdot\frac{e^{-z}}{(1+e^{-z})^2}\cdot h_j$$

$$\frac{\partial L}{\partial b_j} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)\cdot\frac{e^{-z}}{(1+e^{-z})^2}\cdot v_j$$

$$\frac{\partial L}{\partial w_{ij}} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)\cdot\frac{e^{-z}}{(1+e^{-z})^2}\cdot x_i v_j$$