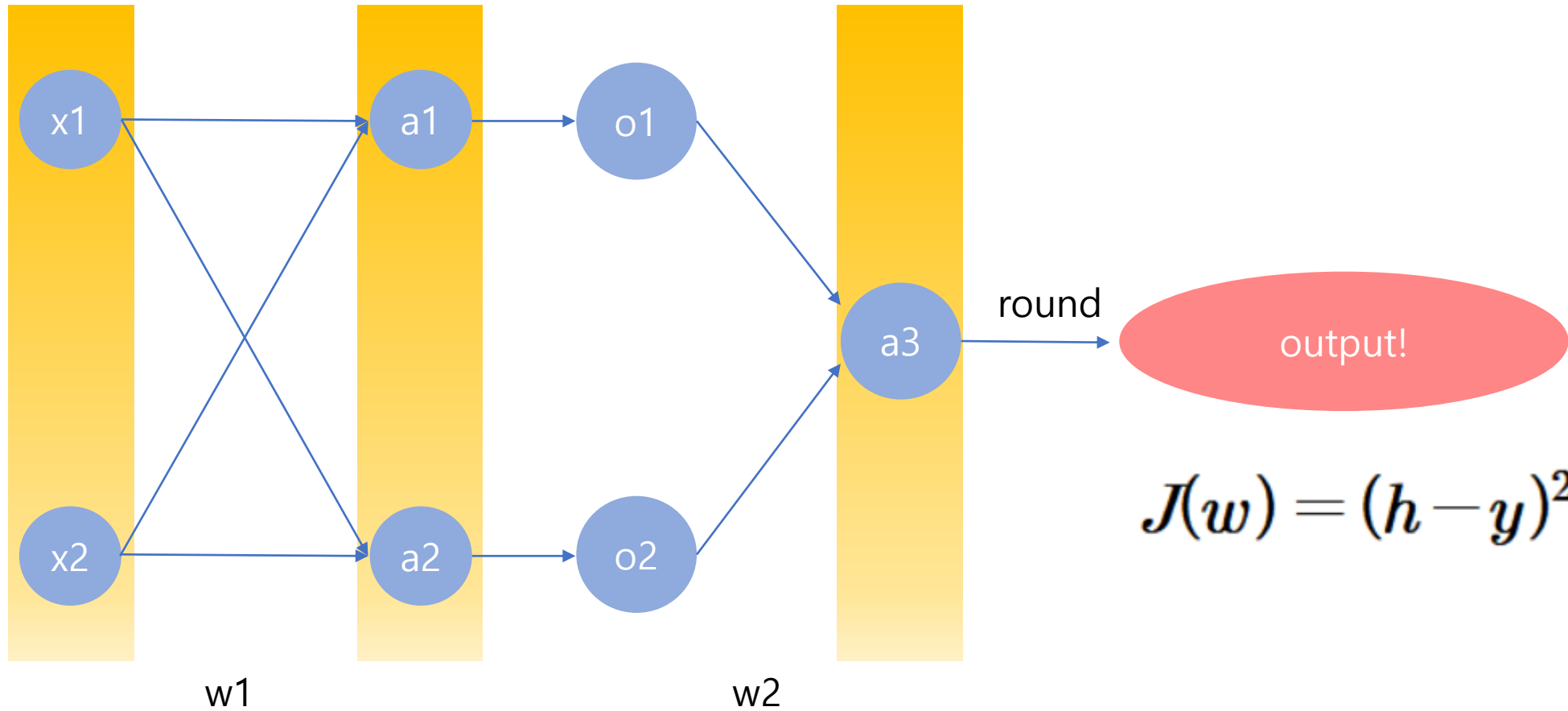


input layer

layer2

output layer

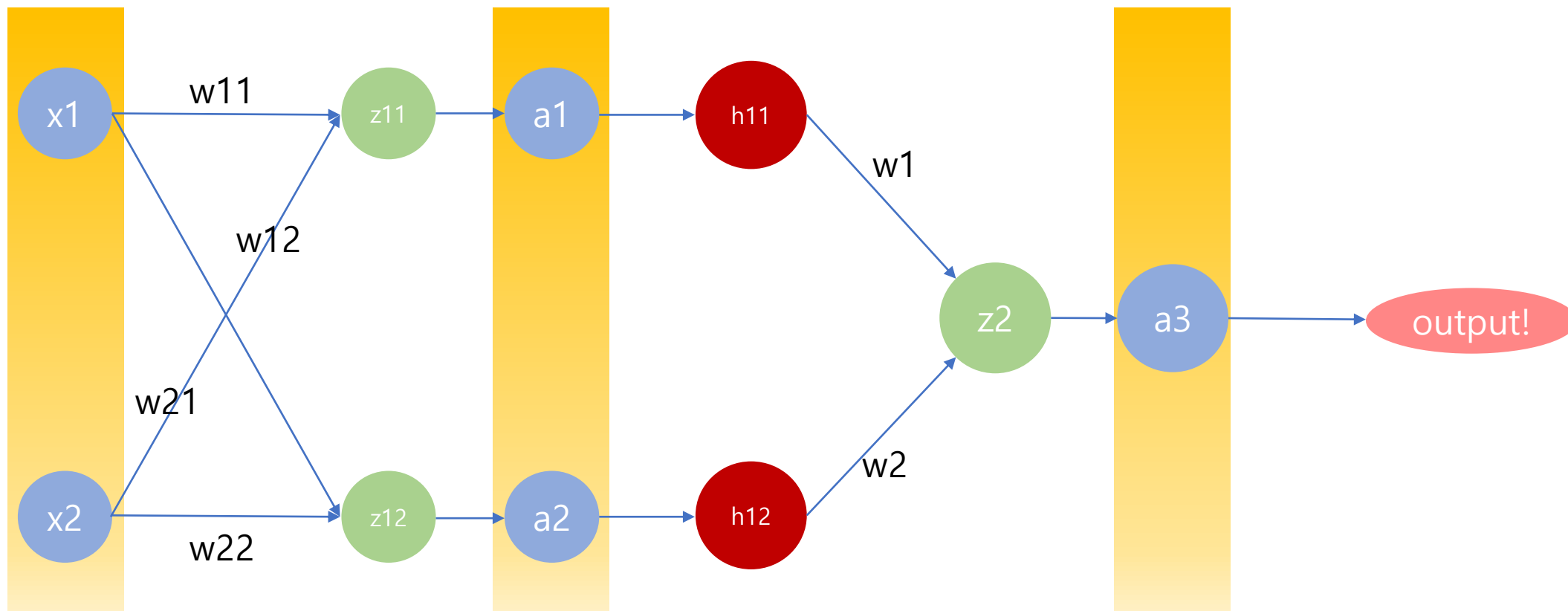


$$J(w) = (h - y)^2$$

input layer

layer2

output layer



$$\begin{aligned} z_{11} &= w_{11}x_1 + w_{12}x_2 \\ z_{12} &= w_{21}x_1 + w_{22}x_2 \end{aligned}$$

$$\begin{aligned} h_{11} &= \text{sigmoid}(z_{11}) \\ h_{12} &= \text{sigmoid}(z_{12}) \end{aligned}$$

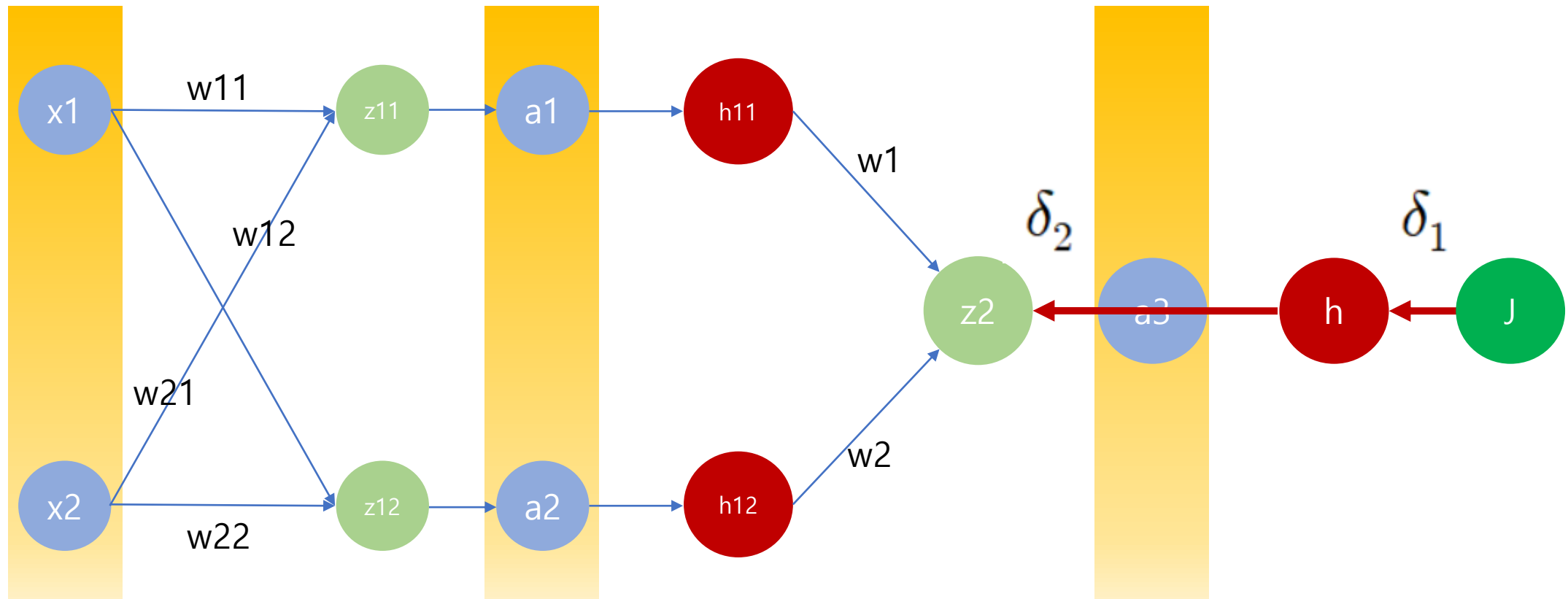
$$z_2 = w_1h_{11} + w_2h_{12}$$

$$\text{output} = \text{sigmoid}(z_2)$$

input layer

layer2

output layer



$$J(w) = (h(w) - y)^2$$

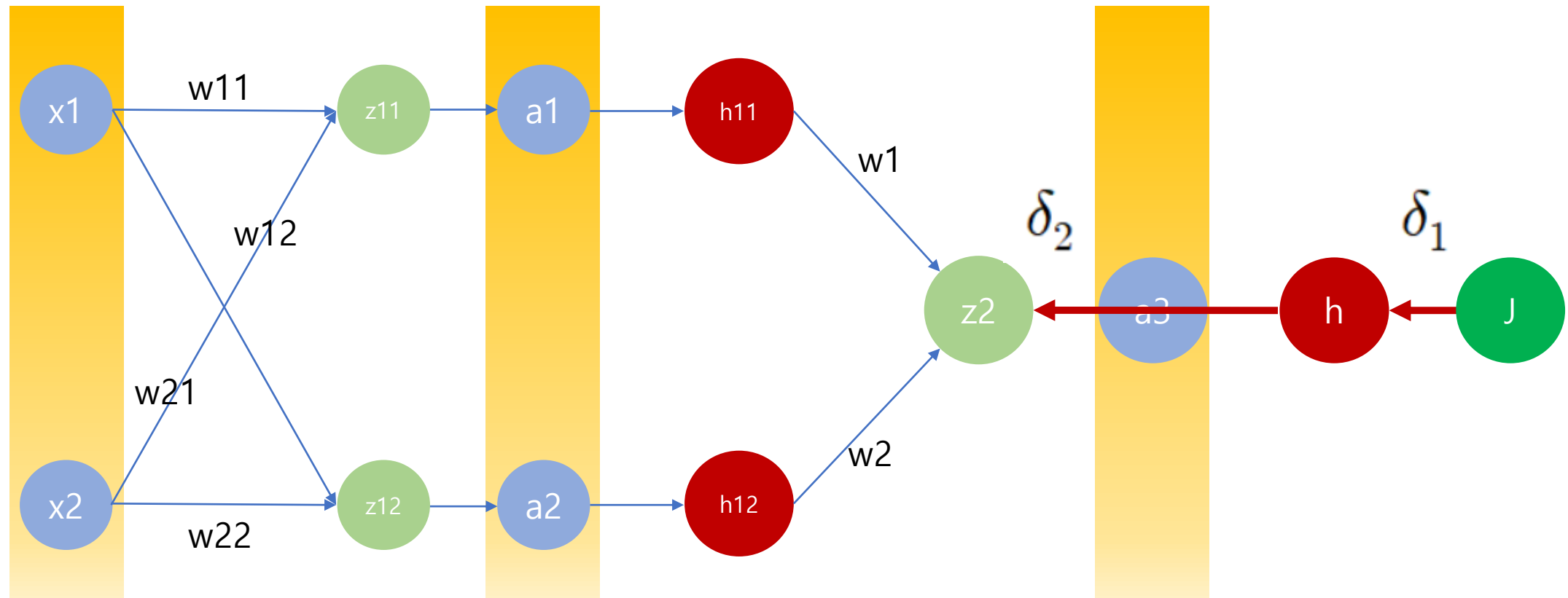
$$\delta_1 = \frac{\partial J}{\partial h} = 2(h - y)$$

$$\delta_2 = \frac{\partial J}{\partial z_2} = \frac{\partial J}{\partial h} \cdot \frac{\partial h}{\partial z_2}$$

input layer

layer2

output layer



$$J(w) = (h(w) - y)^2$$

$$\delta_1 = \frac{\partial J}{\partial h} = 2(h - y)$$

$$\delta_2 = \frac{\partial J}{\partial z_2} = \frac{\partial J}{\partial h} \cdot \frac{\partial h}{\partial z_2}$$

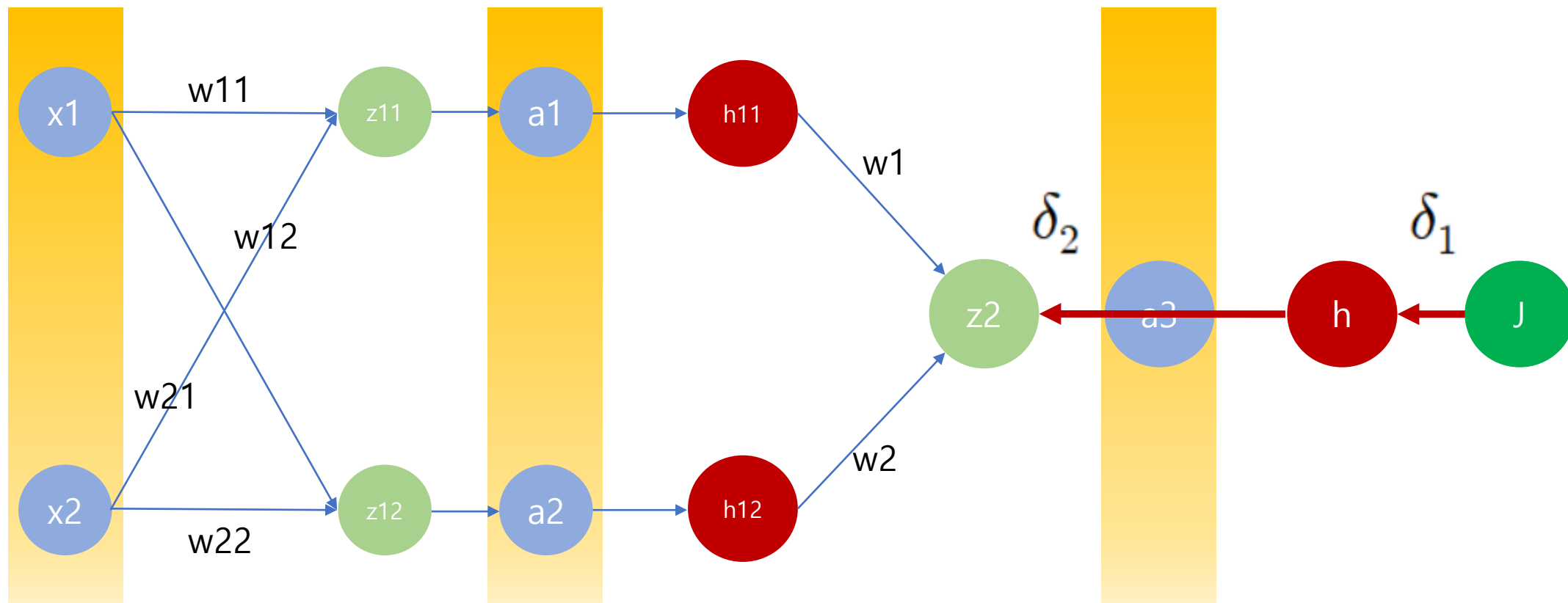
$$h = \text{sigmoid}(z_2)$$

$$\frac{\partial h}{\partial z_2} = h(1 - h)$$

input layer

layer2

output layer



$$J(w) = (h(w) - y)^2$$

$$\delta_1 = \frac{\partial J}{\partial h} = 2(h - y)$$

$$\delta_2 = \frac{\partial J}{\partial z_2} = \frac{\partial J}{\partial h} \cdot \frac{\partial h}{\partial z_2} = \delta_1 \cdot h \cdot (1 - h)$$

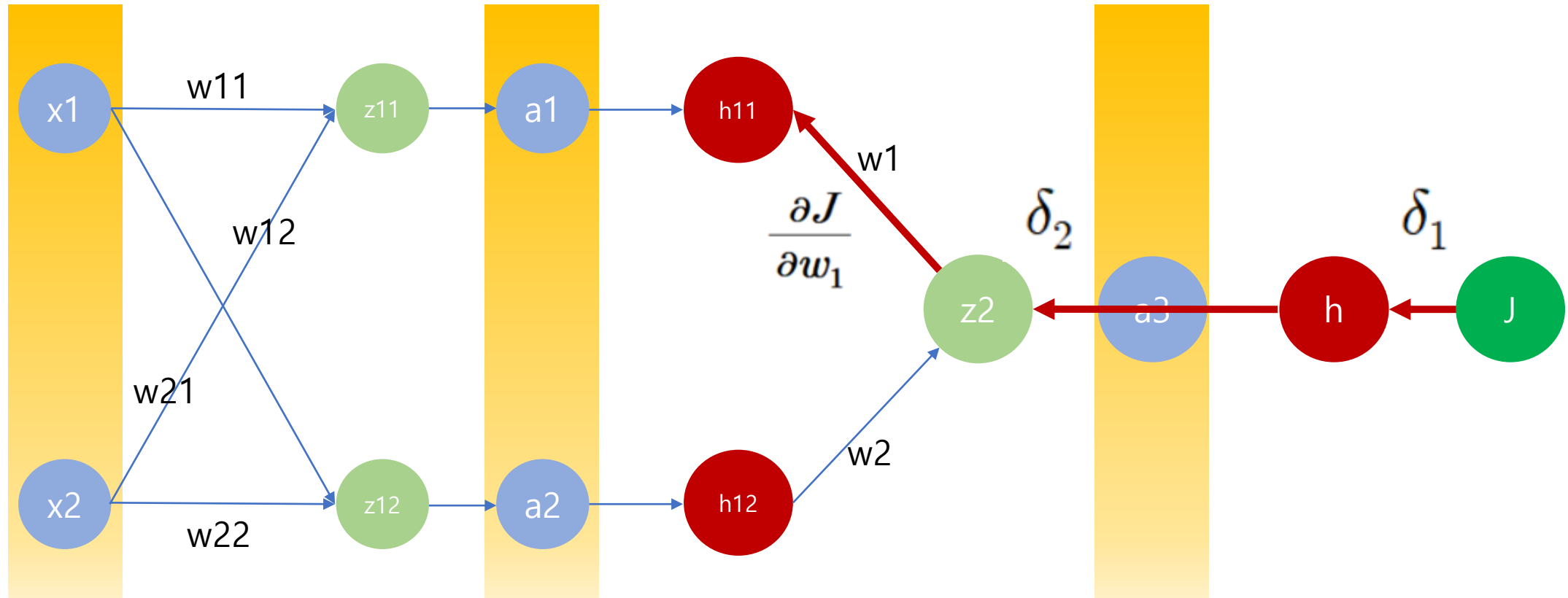
$$h = \text{sigmoid}(z_2)$$

$$\frac{\partial h}{\partial z_2} = h(1 - h)$$

input layer

layer2

output layer



$$J(w) = (h(w) - y)^2$$

$$\delta_1 = \frac{\partial J}{\partial h} = 2(h - y)$$

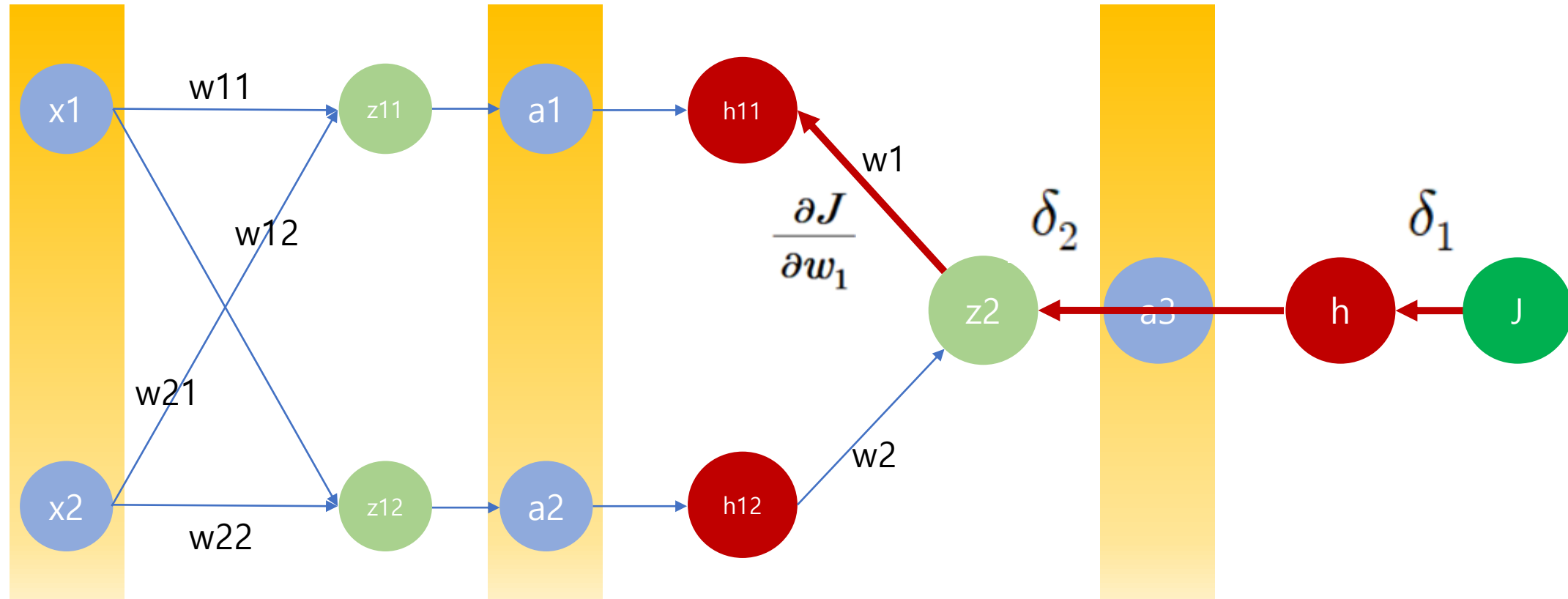
$$\delta_2 = \frac{\partial J}{\partial z_2} = \frac{\partial J}{\partial h} \cdot \frac{\partial h}{\partial z_2} = \delta_1 \cdot h \cdot (1 - h)$$

$$\frac{\partial J}{\partial w_1} = \frac{\partial J}{\partial z_2} \cdot \frac{\partial z_2}{\partial w_1}$$

input layer

layer2

output layer



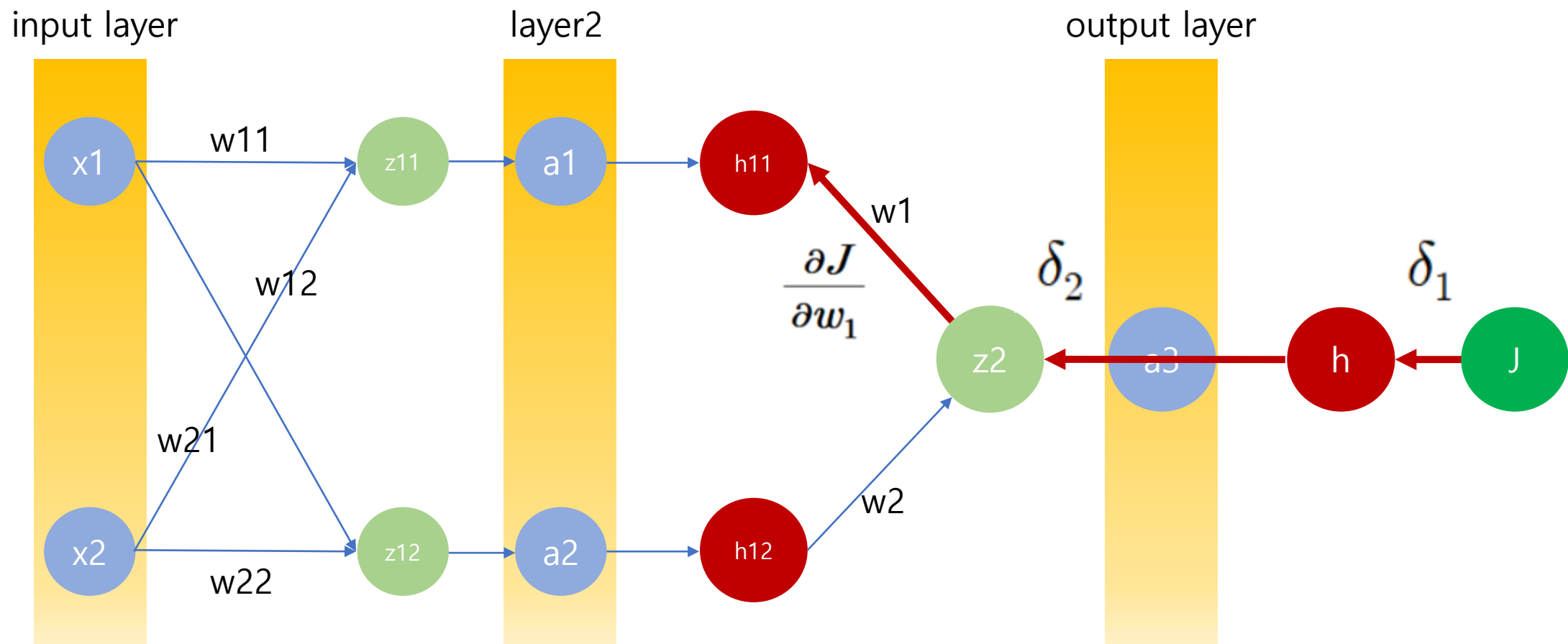
$$J(w) = (h(w) - y)^2$$

$$\delta_1 = \frac{\partial J}{\partial h} = 2(h - y)$$

$$\delta_2 = \frac{\partial J}{\partial z_2} = \frac{\partial J}{\partial h} \cdot \frac{\partial h}{\partial z_2} = \delta_1 \cdot h \cdot (1 - h)$$

$$z_2 = w_1 h_{11} + w_2 h_{12}$$

$$\frac{\partial J}{\partial w_1} = \frac{\partial J}{\partial z_2} \cdot \frac{\partial z_2}{\partial w_1} = \delta_2 \cdot h_{11}$$



$$\frac{\partial J}{\partial w_1} = \frac{\partial J}{\partial z_2} \cdot \frac{\partial z_2}{\partial w_1} = \delta_2 \cdot h_{11} \quad \xrightarrow{\text{update}} \quad w_1 := w_1 - \alpha \frac{\partial J}{\partial w_1}$$