



$$f_1(x_1, w_1) = x_1 \cdot w_1 = y_1 = 1$$

$$\frac{\partial f_1}{\partial x_1} = w_1 \quad \frac{\partial f_1}{\partial w_1} = x_1$$

$$f_2(x_2, w_2) = x_2 \cdot w_2 = y_2 = 2$$

$$\frac{\partial f_2}{\partial x_2} = w_2 \quad \frac{\partial f_2}{\partial w_2} = x_2$$

$$f_3(y_1, y_2, b) = y_1 + y_2 + b = y_3 = 4$$

$$\frac{\partial f_3}{\partial y_1} = \frac{\partial f_3}{\partial y_2} = \frac{\partial f_3}{\partial b} = 1$$

$$f_4(y_3) = y_3 \cdot (-1) = y_4 = -4$$

$$\frac{\partial f_4}{\partial y_3} = -1$$

$$f_5(y_4) = e^{y_4} = y_5 = e^{-4} = 0.01831563$$

$$\frac{\partial f_5}{\partial y_4} = e^{y_4}$$

$$f_6(y_5) = 1 + y_5 = y_6 = 1 + e^{-4} = 1.01831563$$

$$\frac{\partial f_6}{\partial y_5} = 1$$

$$f_7(y_6) = \frac{1}{y_6} = \hat{y} = \frac{1}{1 + e^{-4}} = 0.98201379$$

$$\frac{\partial f_7}{\partial y_6} = \frac{-1}{(y_6)^2}$$

$$\frac{\partial L}{\partial \hat{y}} = 1$$

$$\frac{\partial f_7}{\partial y_6} \cdot \frac{\partial L}{\partial \hat{y}} = \frac{-1}{(1 + e^{-4})^2} \cdot 1 = -0.96435108$$

$$\frac{\partial f_6}{\partial y_5} \cdot \frac{\partial f_7}{\partial y_6} = -0.96435108$$

~~$$\frac{\partial f_5}{\partial y_4} \cdot \frac{\partial f_6}{\partial y_5} = 0.01831563 \cdot 1 = 0.01831563$$~~

$$\frac{\partial f_5}{\partial y_4} \cdot \frac{\partial f_6}{\partial y_5} = e^{-4} \cdot -0.96435108 = -0.01766270$$

$$\frac{\partial f_4}{\partial y_3} \cdot \frac{\partial f_5}{\partial y_4} = (-1) \cdot (-0.01766270) = 0.01766270$$

$$\frac{\partial f_1}{\partial x_1} \cdot \frac{\partial f_3}{\partial y_1} = \frac{\partial f_1}{\partial w_1} \cdot \frac{\partial f_3}{\partial y_1} = 0.01766270 \cdot 1$$

$$\frac{\partial f_2}{\partial x_2} \cdot \frac{\partial f_3}{\partial y_2} = 0.5 \cdot 0.176627 = 0.0883135$$

$$\frac{\partial f_2}{\partial w_2} \cdot \frac{\partial f_3}{\partial y_2} = 4 \cdot 0.176627 = 0.706508$$