"hw02$_f$19$_p$rob01"

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1. Starting with:

$$\delta C = \sum = \frac{\partial C}{\partial a_1^1}\frac{\partial a_4^1}{\partial a_3^3}\frac{\partial a_3^3}{\partial a_2^2}\frac{\partial a_2^2}{\partial w_{21}^2}$$

$$\frac{\partial C}{\partial a_1^4} = \frac{\partial}{\partial a_1^4} = -2y + 2a_1^4$$

$$\frac{\partial a_1^4}{\partial a_3^3} = a_1^4(1 - a_1^4)w_{21}^2$$

$$\frac{\partial a_3^3}{\partial a_2^2} = a_3^3(1 - a_3^3)w_{21}^2$$

$$\frac{\partial a_2^2}{\partial a_1^1} = a_2^2(1 - a_2^2)w_{21}^2$$

$$\frac{\partial a_1^1}{\partial w_{21}^2} = a_1^1(1 - a_1^1)w_{21}^2$$

Making the whole equation:

$$-2y + 2a_1^4 \cdot a_1^4(1 - a_1^4) \cdot w_{21}^2 \cdot a_3^3(1 - a_3^3) \cdot w_{21}^2 \cdot a_2^2(1 - a_2^2) \cdot w_{21}^2 \cdot a_1^1(1 - a_1^1) \cdot w_{21}^2$$