

Recall

$a$  ( $= 4$ )

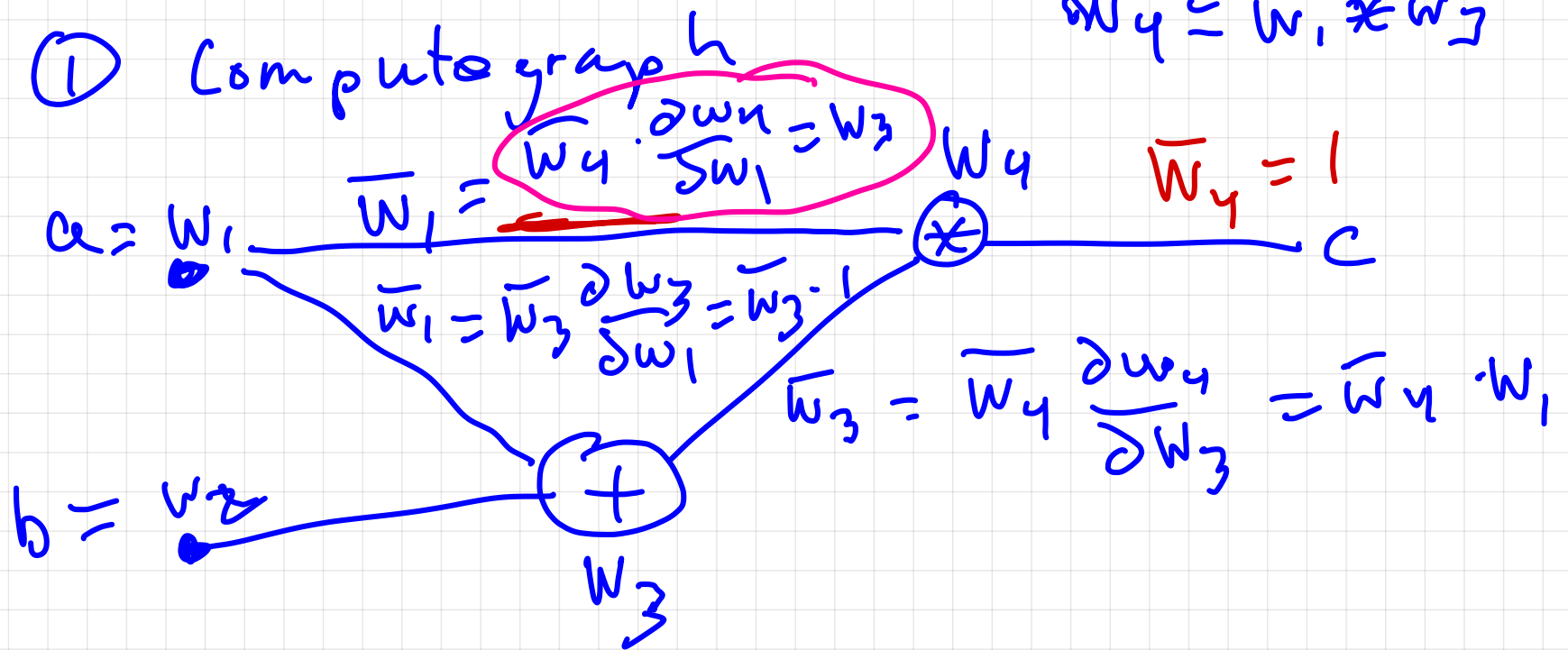
$b$  ( $= 3$ )

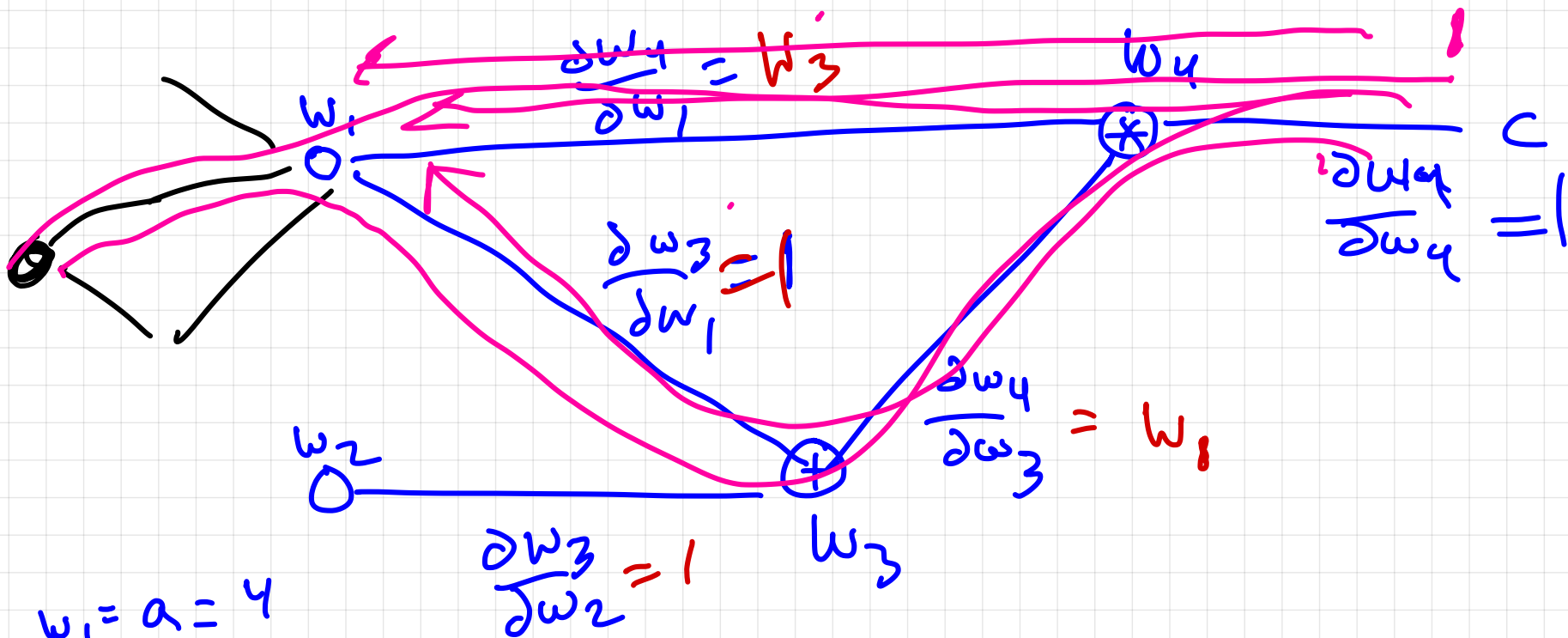
$c = a * (a + b) = w_3 = a + b = w_1 + w_2$

$w_1 = a$   
 $w_2 = b$

Rule:  $\bar{w}_i = \sum_{j \text{ after } i} \bar{w}_j \frac{\partial w_j}{\partial w_i}$

① Computo graph





$$w_1 = a = 4$$

$$w_2 = b = 3$$

$$w_3 = a + b = w_1 + w_2$$

$$w_4 = w_1 * w_3$$

Think of each node:  $(+)$   $(*)$

Two variables in, one variable out  $= a + b + a$   
 $= 2a + b$

$$\frac{\partial C}{\partial a} = 1 \cdot w_3 + 1 \cdot w_1 \cdot 1$$

$$= w_3 + w_1$$

## Two operations

$$\textcircled{1} \quad w_k = w_i + w_j$$

$$\rightarrow \frac{\partial w_k}{\partial w_i} = 1 \quad \frac{\partial w_k}{\partial w_j} = 1$$

$$\textcircled{2} \quad w_k = w_i * w_j$$

$$\rightarrow \frac{\partial w_k}{\partial w_i} = w_j$$

$$\frac{\partial w_k}{\partial w_j} = w_i$$