1 GRADIENT DESCENT

$$C'(w) = \lim_{e \to 0} \frac{C(w+e) - C(w)}{e}$$

1.1 Double

$$\begin{aligned}
C(w) &= \frac{1}{n} \sum_{i=1}^{n} (x_i w - y_i)^2 \\
C'(w) &= \left(\frac{1}{n} \sum_{i=1}^{n} (x_i w - y_i)^2 \right)' \\
&= \frac{1}{n} \left(\sum_{i=1}^{n} (x_i w - y_i)^2 \right)' \\
&= \frac{1}{n} \Big((x_0 w - y_0)^2 + (x_1 w - y_1)^2 + \ldots + (x_n w - y_n)^2 \Big)' \\
&= \frac{1}{n} \sum_{i=1}^{n} \Big((x_i w - y_i)^2 \Big)' \\
&= \frac{1}{n} \sum_{i=1}^{n} 2(x_i w - y_i)(x_i w - y_i)' \\
&= \frac{1}{n} \sum_{i=1}^{n} 2(x_i w - y_i)(x_i w)' \\
&= \frac{1}{n} \sum_{i=1}^{n} 2(x_i w - y_i){x_i}'
\end{aligned}$$

$$\begin{aligned}
C(w) &= \frac{1}{n} \sum_{i=1}^{n} (x_i w - y_i)^2 \\
C'(w) &= \frac{1}{n} \sum_{i=1}^{n} 2(x_i w - y_i){x_i}'
\end{aligned}$$

1.2 One neuron model with 1 input