0.1 Differentiating constants, the identity function, and linear functions

0.1.1 Constants

$f(x) = c$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{f(x+\epsilon) - f(x)}{\epsilon}$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{c - c}{\epsilon} = 0$

0.1.2 x

$f(x) = x$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{f(x+\epsilon) - f(x)}{\epsilon}$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{x + \epsilon - x}{\epsilon} = 1$

0.1.3 Addition

$f(x) = g(x) + h(g)$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{g(x+\epsilon) + h(x+\epsilon) - g(x) - h(x)}{\epsilon}$

$\frac{\delta y}{\delta x} = \lim_{\epsilon \to 0^+} \frac{g(x+\epsilon) - g(x)}{\epsilon} + \lim_{\epsilon \to 0^+} \frac{h(x+\epsilon) - h(x)}{\epsilon}$

$\frac{\delta y}{\delta x} = \frac{\delta g}{\delta x} + \frac{\delta h}{\delta x}$