


Scalar  $f$  :

$$\Delta f = \frac{\partial f}{\partial x_1} \Delta x_1 + \cdots + \frac{\partial f}{\partial x_n} \Delta x_n$$

$$f : \mathbb{R}^n \rightarrow \mathbb{R}$$


$$\Delta f = \begin{bmatrix} \frac{\partial f}{\partial x_1} & \cdots & \frac{\partial f}{\partial x_n} \end{bmatrix} \begin{bmatrix} \Delta x_1 \\ \vdots \\ \Delta x_n \end{bmatrix} \mathbf{I}$$