Notes for Vector Calculus

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Chapter 1.

Directional and Partial Derivatives

§1.1 Basic Definitions

Definition 1.1.1. Let $X \subseteq \mathbb{R}^n$, $Y \subseteq \mathbb{R}^m$, and let $f : X \to Y$.

The *i-th partial derived function of* f is the function $\nabla_{x_i} f : X \to Y$ defined as

$$\nabla_{x_i} f(x) := \begin{cases} \lim\limits_{h \to 0} \dfrac{f(x + h\hat{e}_i) - f(x)}{h} & \text{, if the limit exists;} \\ 0 & \text{, else.} \end{cases}$$