Directional Derivatives and the Gradient Vector

Sps $f: \mathbb{R}^n \to \mathbb{R}$ * and $\bar{v} \in \mathbb{R}^n$ (domain) is a unit vector.

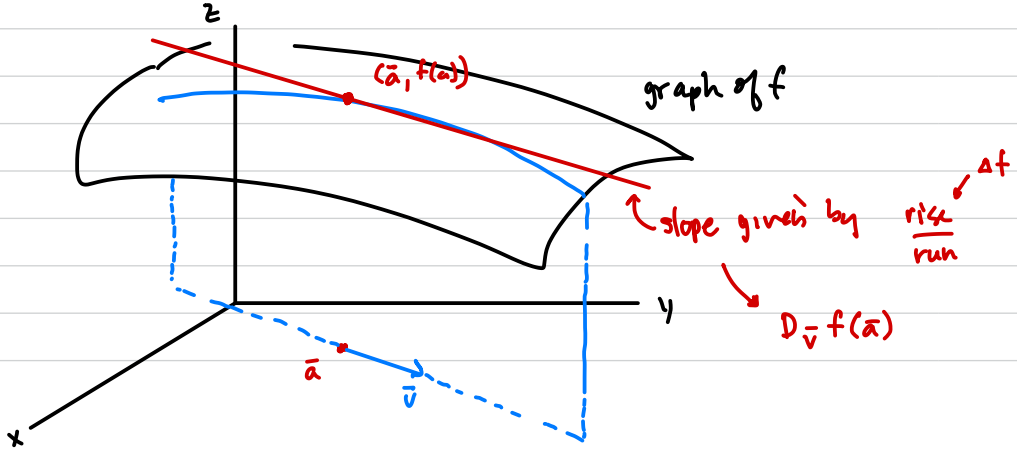
The directional derivative of f in the direction of $\bar{v}$ is:

(limit gives slope of tangent line.)

$$D_{\bar{v}} f(\bar{a}) = \lim_{h \to 0} \frac{f(\bar{a} + h\bar{v}) - f(\bar{a})}{h}$$ ← rise, ← run of secant lines.

↳ how does f change as you move from $\bar{a}$ in direction of $\bar{v}$?

Geometrically: (special case $f: \mathbb{R}^2 \to \mathbb{R}$)



Ex $f: \mathbb{R}^2 \to \mathbb{R}$

$\vec{i} = (1, 0)$

$\vec{j} = (0, 1)$

$$D_{\vec{i}} f = \frac{\partial f}{\partial x}$$

$$D_{\vec{j}} f = \frac{\partial f}{\partial y}.$$