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# Gradient Descent

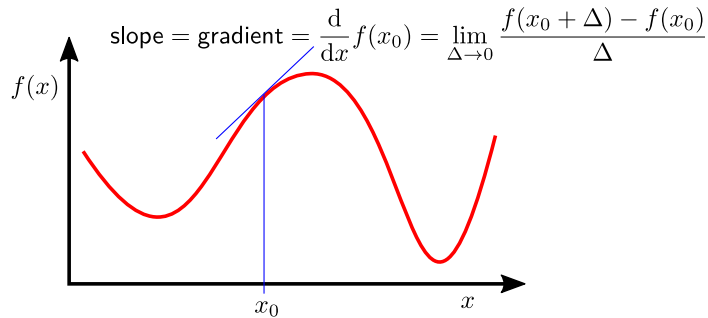
Justus Piater

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### 1. Preface

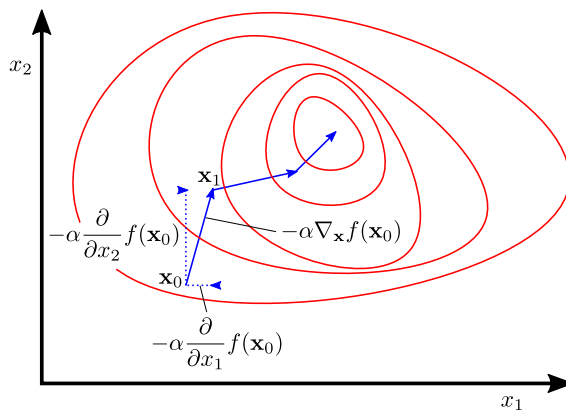
#### 1.1. Gradient Descent on a 1D Function



$$x_1 \leftarrow x_0 - \alpha \frac{d}{dx} f(x_0)$$

$\alpha$  is a step-size parameter that must be chosen by hand or determined (adaptively) by automatic means.

#### 1.2. Gradient Descent on a 2D Function



$$\mathbf{x}_1 \leftarrow \mathbf{x}_0 - \alpha \nabla_{\mathbf{x}} f(\mathbf{x}_0) \quad \nabla_{\mathbf{x}} f(\mathbf{x}) = \begin{bmatrix} \frac{\partial}{\partial x_1} f(\mathbf{x}) \\ \vdots \\ \frac{\partial}{\partial x_D} f(\mathbf{x}) \end{bmatrix}$$