

Convergent Criteria

$$1) \|\nabla f\| < \varepsilon$$

$$2) |f(x_{k+1}) - f(x_k)| < \varepsilon$$

$$f(\underline{x}) = f(x_1, \dots, x_n)$$

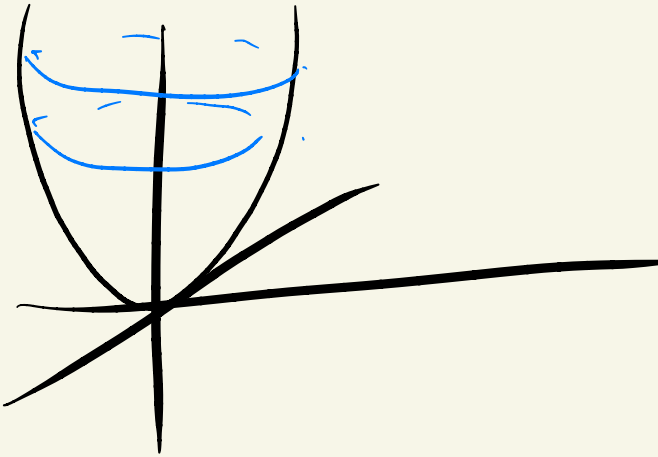
1st Order Necessary Condition:

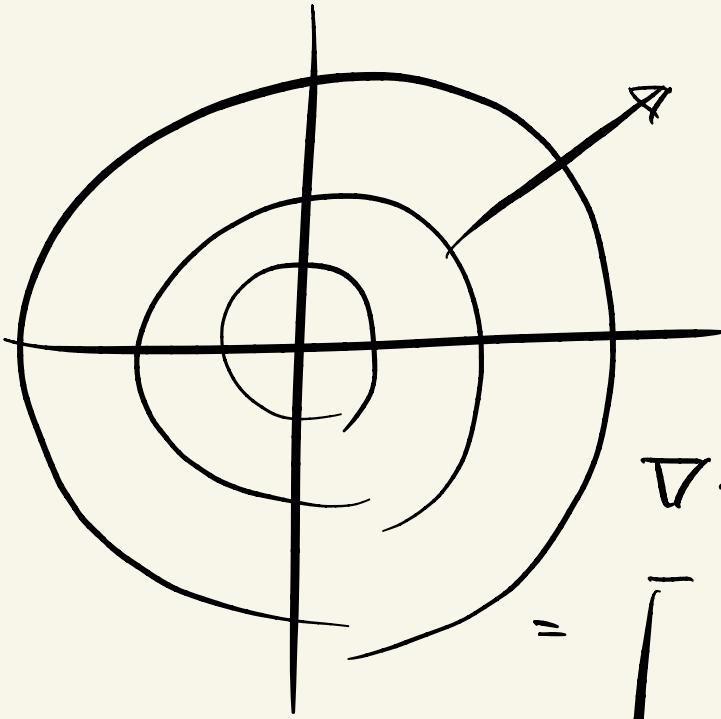
$$\frac{\partial f}{\partial x_1} = 0, \quad \frac{\partial f}{\partial x_n} = 0, \quad \dots$$

Gradient

$$\nabla f = \begin{bmatrix} \frac{\partial f}{\partial x_1} \\ \frac{\partial f}{\partial x_2} \\ \vdots \\ \frac{\partial f}{\partial x_n} \end{bmatrix} = 0$$

$$f(x, y) = x^2 + y^2$$





$$\nabla f = \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix}$$

$$= \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix}$$

\Rightarrow Steepest descent
Gradient descent