1 Vo

Anα $\overline{\underline{III}}$

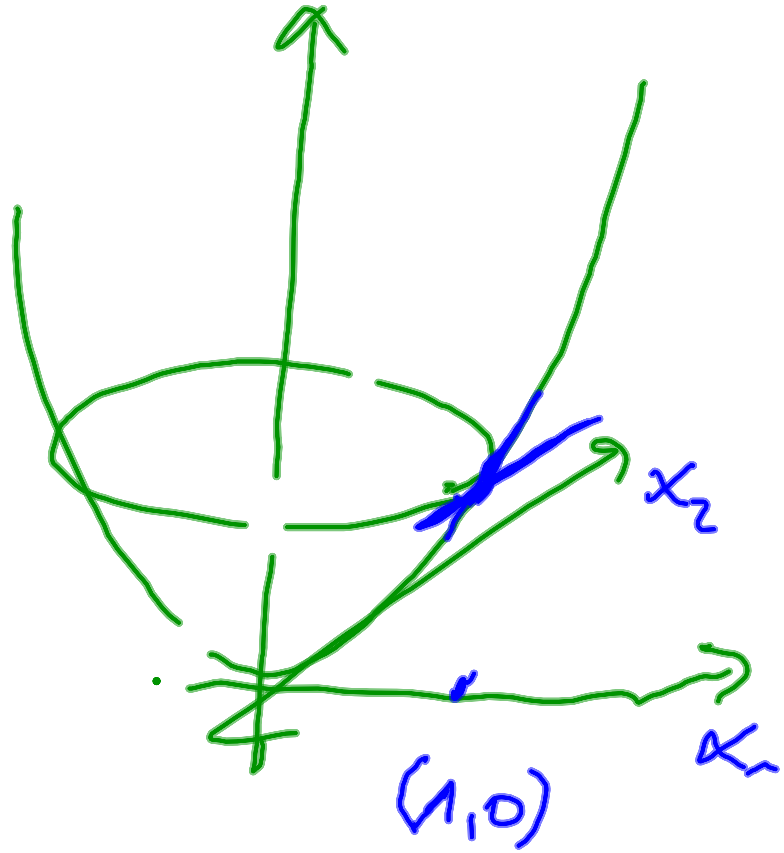
$$\frac{\partial f}{\partial x_1} = \frac{\partial}{\partial x_1}\left(x_1^2 + x_2^2\right) =$$

$$= 2x_1$$

$$\frac{\partial f}{\partial x_2} = 2x_2$$

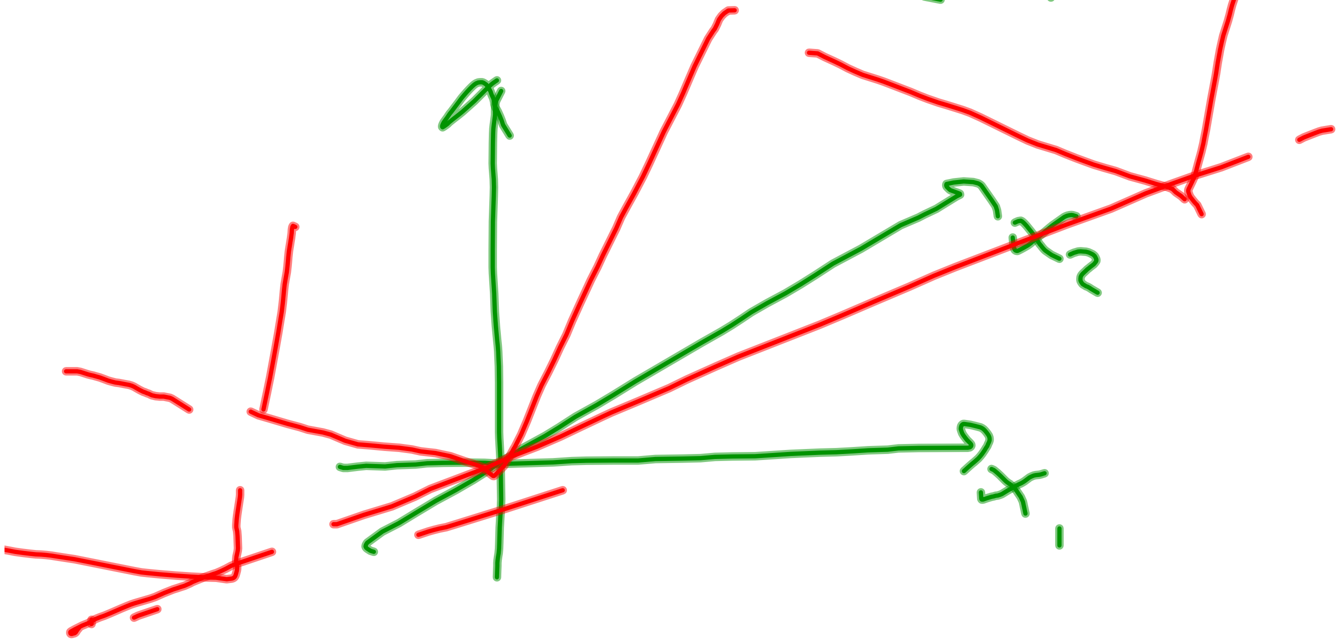
$$\frac{\partial f}{\partial x_1}(1,0) = 1$$

$$\partial f / \partial x_2 (1,0) = 0$$



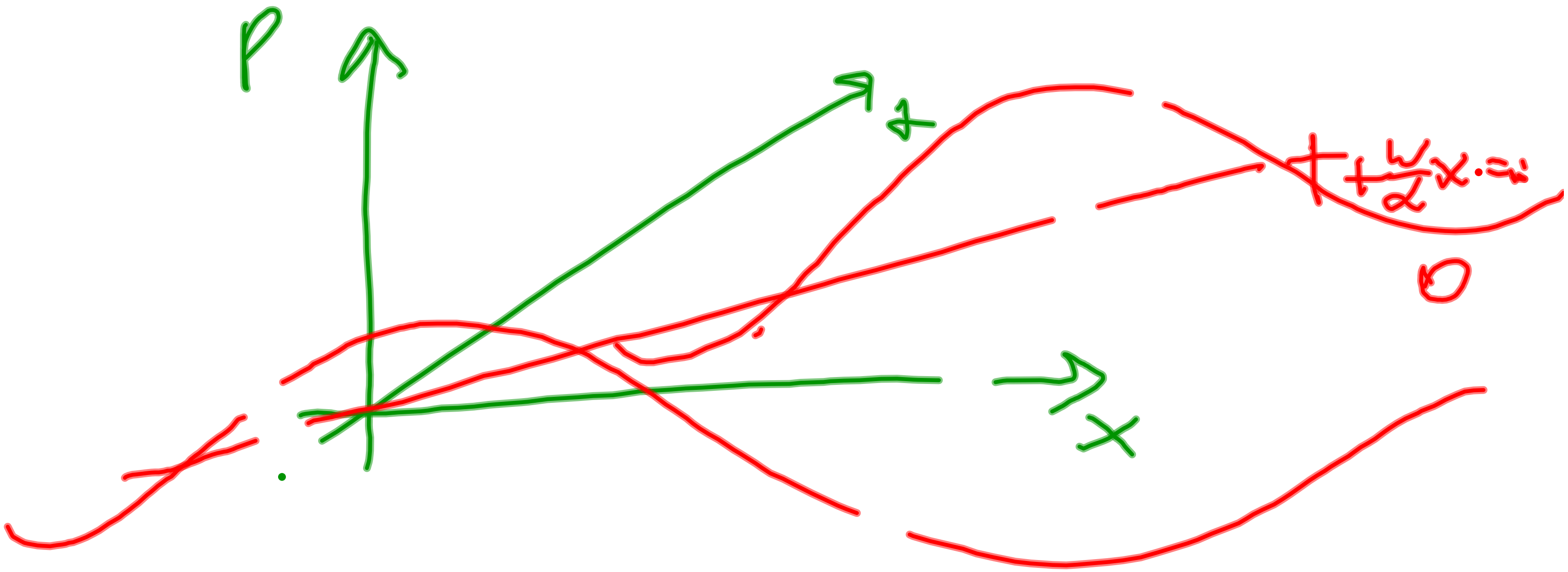
$$f(x_1, x_2) = x_1 + |x_2|$$

$$\frac{\partial f}{\partial x_1} = 1 \quad , \quad \frac{\partial f}{\partial x_2} \nexists \text{ bei } x_2 := 0$$



$$p(x,t) = A \sin(\alpha t + \omega x)$$

$$= A \sin\left(\alpha\left(t + \frac{\omega}{\alpha} x\right)\right)$$

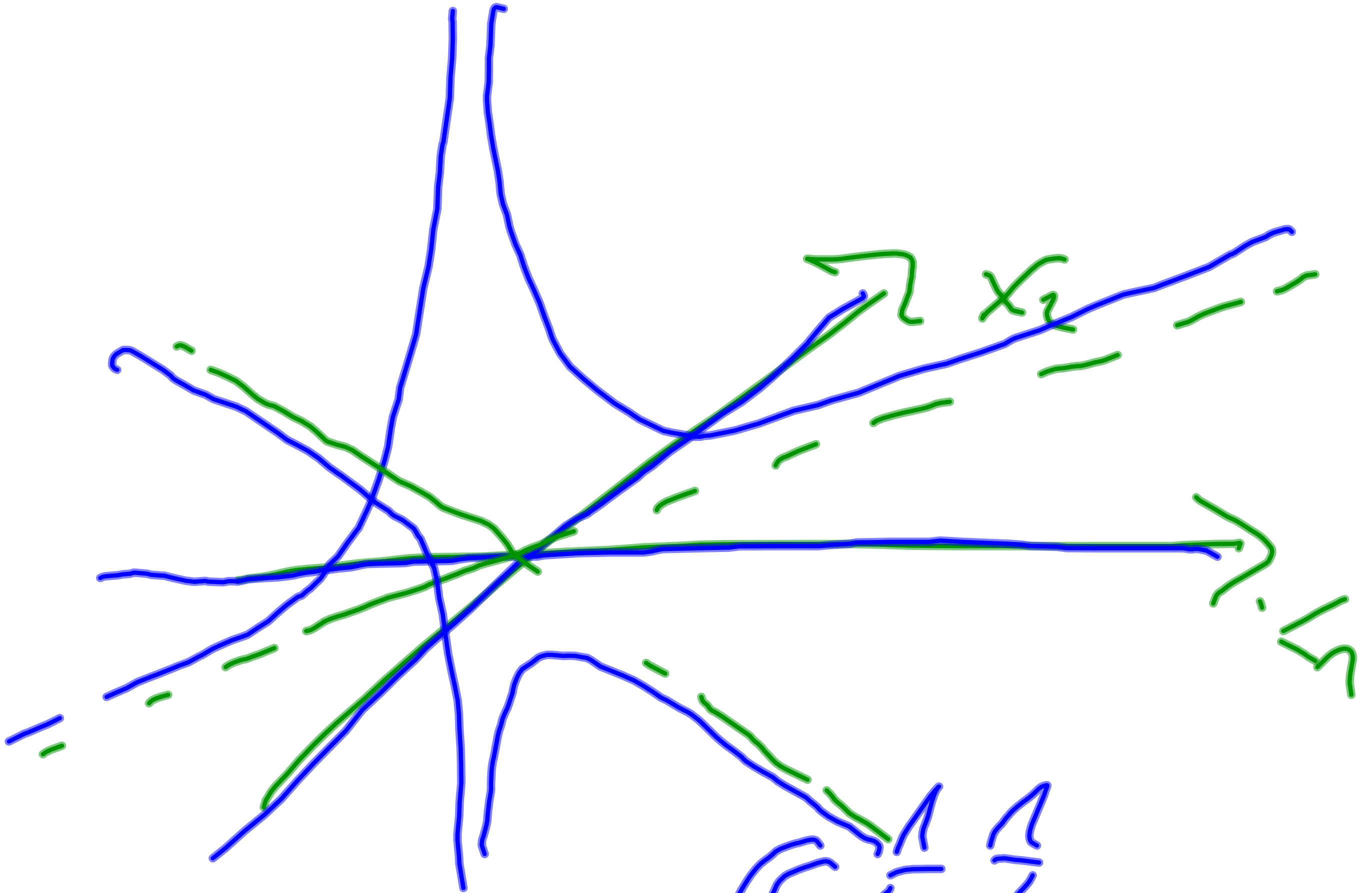


$$r(x) = \|x\|_2 = \sqrt{x_1^2 + x_2^2 + \dots + x_n^2}$$

$$\frac{\partial r}{\partial x_i} = \frac{\cancel{2} x_i}{\cancel{2}\sqrt{}} = \frac{x_i}{r(x)}$$

$$\nabla r = \frac{1}{r(x)} \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix} = \frac{x}{r(x)}$$

$$f(x,y) = \begin{cases} \dfrac{xy}{(x^2+y^2)} \\ 0 & \text{a } (0,0) \end{cases}$$



$x = ?$

$$f(x,x) = \frac{x^2}{(2x^2)^2} = \int \frac{1}{4x^2} \qquad \frac{1}{4} \cdot \frac{1}{4} \cdot$$

$$f(x) - f(x_0) = f(x_1, x_2) - f(x_1^0, x_2^0) =$$

$$= f(x_1, x_2) - f(x_1, x_2^0)$$

$$+ f(x_1, x_2^0) - f(x_1^0, x_2^0) =$$

$$= \frac{\partial f}{\partial x_2}(x_1, \xi_2)(x_2 - x_2^0)$$

$$+ \frac{\partial f}{\partial x_1}(\xi_1, x_2^0)(x_1 - x_1^0)$$

$$x \to x^0 \quad \begin{cases} x_2 \to x_2^0 \\ x_1 \to x_1^0 \end{cases}$$

$$|f(x) - f(x_0)| \le C_1 |x_2 - x_2^0| + C_2 |x_1 - x_1^0| \longrightarrow 0$$

$$f = f(x, y)$$

$$\frac{\partial^2}{\partial x \partial y} f = \frac{\partial}{\partial x}\left(\frac{\partial f}{\partial y}\right) \stackrel{?}{=} \frac{\partial}{\partial y}\left(\frac{\partial f}{\partial x}\right) = \frac{\partial^2}{\partial y \partial x} f$$

$$f = 2x_1$$

$$\frac{\partial^2}{\partial x_1 \partial x_2} f = 0 = \frac{\partial^2 f}{\partial x_2 \partial x_1}$$

$$\frac{\partial f}{\partial x}(0,0) = \lim_{t\to 0} \frac{f(t,0)-f(0,0)}{t} = \lim \frac{t\cdot 0 \text{------} - 0}{t}$$

$$= 0$$

$$\frac{\partial f}{\partial x}(x,y) = y\frac{x^2-y^2}{x^2+y^2} + xy\frac{2x(x^2+y^2)-2x(x^2-y^2)}{(x^2+y^2)^2}$$

$$\frac{\partial^2 f}{\partial y\,\partial x}(0,0) = \lim_{t\to 0} \frac{\frac{\partial f}{\partial x}(0,t) - \frac{\partial f}{\partial x}(0,0)}{t} = \lim_{t\to 0}$$

$$\frac{t\frac{-t^2}{t^2} + 0\cdot t \text{------} - 0}{t} = -1$$

$$f(x_1, x_2) = x_1^3 + x_2^2$$

$$\Delta f = \frac{\partial^2}{\partial x_1^2} f + \frac{\partial^2}{\partial x_2^2} f = 6x_1 + 2$$

$$f = f(x,y,z) = \begin{pmatrix} f_1(x,y,z) \\ f_2(x,y,z) \end{pmatrix}$$

$m = 2$

$n = 3$

$$\left(\frac{\partial f_1}{\partial x}, \frac{\partial f_1}{\partial y}, \frac{\partial f_1}{\partial z}\right)^T = \nabla f_1, \quad \frac{\partial f}{\partial x} = \begin{pmatrix} \frac{\partial f_1}{\partial x} \\ \frac{\partial f_2}{\partial x} \end{pmatrix}$$

$$f(x_1,x_2) = x_1^2 + x_2^2$$