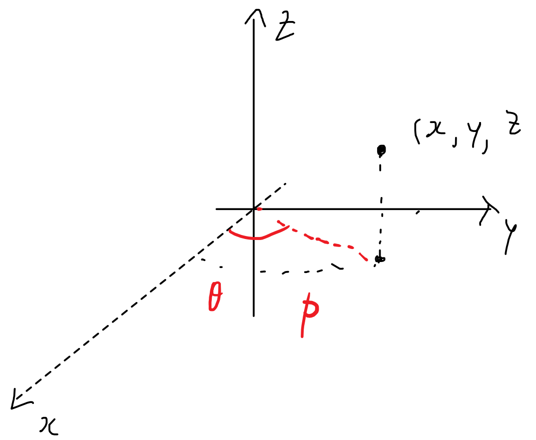
Coordenadas cilíndricas em $\mathbb{R}^3$

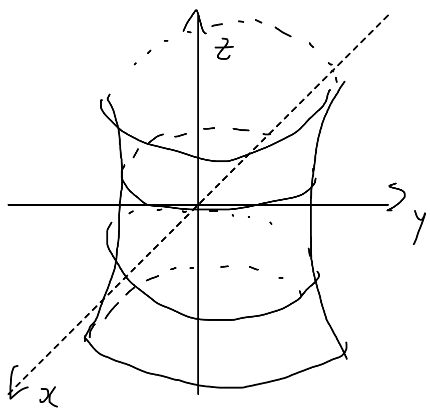


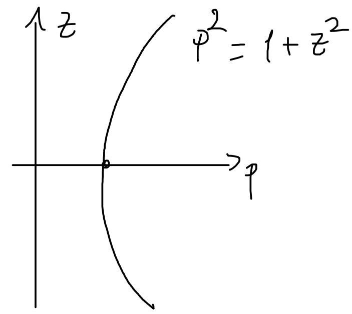
$\rho = \sqrt{x^2+y^2}$

$\begin{cases} x = \rho \operatorname{sen}(\theta) \\ y = \rho \cos(\theta) \end{cases}$

(ρ, θ, z) coordenadas cilíndricas

$x^2+y^2-z^2=1 \longleftrightarrow \rho^2-z^2=1$





Teorema de Schwarz

$f: D \subset \mathbb{R}^n \to \mathbb{R}^m$, D aberto, dif. em D

Se $\frac{\partial f}{\partial x_j} : D \subset \mathbb{R}^n \to \mathbb{R}^m$ forem dif.

$j = 1, \dots, n$

Podemos tomar as 2ª derivadas parciais de f: $\frac{\partial}{\partial x_i}\left(\frac{\partial f}{\partial x_j}\right) = \frac{\partial^2 f}{\partial x_i x_j}$

Se as 2ª derivadas forem dif. as 3ª derivadas são: $\frac{\partial}{\partial x_k}\left(\frac{\partial^2 f}{\partial x_i x_j}\right) = \frac{\partial^3 f}{\partial x_k x_i x_j}$

Logo ordem K são: $\frac{\partial^K f}{\partial x_{i_1}, \dots, \partial x_{i_K}}$ $\quad i_1, \dots, i_K = 1, \dots, M$

Se todas as derivadas de ordem K de f existem e são contínuas em D então f é de ordem C^K em D aka $f \in C^K(D)$

$f: D \subset \mathbb{R}^n \to \mathbb{R}$ $\quad$ D aberto

$f \in C^k(D)$ $\quad$ $k \geq 2$

$\forall a \in D$

$$\frac{\partial^2 f}{\partial x_i x_j} = \frac{\partial^2 f}{\partial x_j x_i}$$

A ordem não interessa