Info

This note found here
as a part of a collection
is written (completely with human hands) by Rupadarshi Ray,
created on January 22, 2026 11:03:36 AM,
and was last modified on January 22, 2026 11:40:44 AM.

First order PDEs in $\mathbb{R}^n$

Let $U \subseteq \mathbb{R}^n$

$$F : O \subseteq U \times \mathbb{R} \times \mathbb{R}^n \to \mathbb{R}$$

be a $\mathcal{C}^1$ function. We wish to find a $\mathcal{C}^1$ function

$$u : U \to \mathbb{R}$$

such that

$$F(x, u(x), \mathrm{d}_x u) = 0 \text{ on } U$$

Given such a solution,

$$\{x_{n+1} = u(x)\} \subseteq \mathbb{R}^{n+1}$$

is a $\mathcal{C}^1$-hypersurface which

linear

- *Non-characteristic condition*

$$\det \begin{bmatrix} \frac{\partial h}{\partial s_1} & \dots & \frac{\partial h}{\partial s_{n-1}} & a(h(s)) \end{bmatrix} \neq 0$$

Current note has 0 direct children and 0 total descendants.

- stamp stamp
  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
    - equations
      - n 1 First order PDEs in $\mathbb{R}^n$

And it has 3 siblings.

- stamp stamp
  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
    - equations
      - 2 Equations for functions on $\mathbb{R}^2$
      - 2 1 ql Quasi-linear PDEs on $\mathbb{R}^2$
      - n 1 First order PDEs in $\mathbb{R}^n$