

This note, that [was found here](#), as a part of [a collection](#) is written (completely with human hands) by [Rupadarshi Ray](#), was created on January 22, 2026 11:03:36 AM, was last modified on January 22, 2026 11:40:44 AM, and was exported on September 7, 2026 3:09:50 PM.

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

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

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

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

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

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*

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

Current note has 0 direct children and 0 total descendants.

- [stem](#)
 - [subobjects of and functions on \$\mathbb{R}^n, S^n, \mathbb{C}^n\$ and its quotients \$\Gamma \backslash \mathbb{R}^n, \Gamma \backslash \mathbb{C}^n\$](#)
 - [equations](#)
 - [First order PDEs in \$\mathbb{R}^n\$](#)

And it has 5 siblings.

- [stem](#)
 - [subobjects of and functions on \$\mathbb{R}^n, S^n, \mathbb{C}^n\$ and its quotients \$\Gamma \backslash \mathbb{R}^n, \Gamma \backslash \mathbb{C}^n\$](#)
 - [equations](#)
 - [Equations for functions on \$\mathbb{R}^2\$](#)
 - [Quasi-linear PDEs on \$\mathbb{R}^2\$](#)
 - $$\partial_t^2 + \sum_{i=1}^n v_i^2 \partial_{x_i}^2 + m^2$$
 - [First order PDEs in \$\mathbb{R}^n\$](#)
 - $$\partial_t^2 + \sum_{i=1}^n v_i^2 \partial_{x_i}^2$$