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ODEs in $\mathbb{R}^n \leftrightarrow$ Vector fields in $\mathbb{R}^n$

Let

$$f : \Omega \subseteq \mathbb{R} \times \mathbb{R}^n \rightarrow \mathbb{R}^n$$

be a **time-dependent vector field** and $(x_0, y_0) \in \Omega$.

- There are a lot of possibilities for its regularity
 - f is measurable
 - f is continuous
 - f is Lipschitz [Existence of integral curves of vector fields in \$\mathbb{R}^n\$](#)
 - f is $\mathcal{C}^k$
 - f is smooth
 - f is $\mathbb{R}$ -analytic
 - f is holomorphic for $n \in 2\mathbb{Z}_{>0}$
- The vector field may be of a certain form (time dependent/intependent)
 - linear
 - Hamiltonian vector field
 - gradient vector field
 - Euler-Lagrange vector field

Current note has 10 direct children and 10 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\$](#)
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 - [Euler's iterative solution method for first order ODEs](#)
 - [Existence of integral curves of vector fields in \$\mathbb{R}^n\$](#)
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 - [Flow of a vector field in \$\mathbb{R}^n\$](#)
 - [Graph \$\rightarrow\$ polynomial ODE](#)
 - [Gradient flows on \$\mathbb{R}^n\$](#)
 - [Hamiltonian vector fields in \$\mathbb{R}^{2n}\$ with standard symplectic form](#)
 - [Probability distribution of flow](#)
 - [Volume change by flows on \$\mathbb{R}^n\$](#)

And it has 39 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\$](#)
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 - [Complex ODEs in \$\mathbb{C}\$](#)
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 - [Laplace operator on \$\mathbb{R}^n\$](#)
 - $l^\infty(\mathbb{R})$
 - [Lebesgue measurable subsets of and functions on \$\mathbb{R}^n, T^n, S^n\$](#)
 - [Lebesgue measure of boundary of open sets in \$\mathbb{R}^n\$](#)
 - [Local \$\mathbb{R}\$ -algebras](#)
 - $l^p(\mathbb{R})$
 - [Metric density of subsets of \$\mathbb{R}^n\$](#)
 - [Monotone functions on \$\mathbb{R}\$](#)
 - [Cauchy integral of periodic functions](#)
 - [Polygons with integer vertices](#)
 - [Open smooth maps \$U \subseteq \mathbb{R}^2 \rightarrow \mathbb{C}\$](#)
 - [Discrete subgroups of \$\mathbb{R}^n\$](#)
 - [Discrete cocompact subgroups of \$\mathbb{R}^n\$, flat tori](#)

- Ramified germs of smooth and holomorphic functions
- Open subsets of $\mathbb{R}^n$
- Open subsets of $\mathbb{R}^n$ equipped with the flat metric
- Closed subsets of $\mathbb{R}^n$ equipped with smooth functions
- Quasi-analytic smooth functions on $\mathbb{R}$
- Star-shaped subsets of $\mathbb{R}^n$
- ODEs in $\mathbb{R}^n \leftrightarrow$ Vector fields in $\mathbb{R}^n$