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

Let

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

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 stamp.Rf.Vec.existence
  - 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/independent)
  - linear
  - Hamiltonian vector field
  - gradient vector field
  - Euler-Lagrange vector field

Current note has 10 direct children and 10 total descendants.

- stamp stamp
  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
    - Vec ODEs in $\mathbb{R}^n \leftrightarrow$ Vector fields in $\mathbb{R}^n$
      - cons Constant of a flow in $\mathbb{R}^n$
      - Euler method Euler's iterative solution method for first order ODEs

        - existence Existence of integral curves of vector fields in $\mathbb{R}^n$
        - fixed Fixed points
        - flows Flow of a vector field in $\mathbb{R}^n$
        - from graphs Graph $\to$ polynomial ODE
        - grad Gradient flows on $\mathbb{R}^n$
        - Hamiltonian Hamiltonian vector fields in $\mathbb{R}^{2n}$ with standard symplectic form
        - probability distribution Probability distribution of flow
        - volume Volume change by flows on $\mathbb{R}^n$

And it has 36 siblings.

- stamp stamp
    - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
        - 1Hol Holomorphic functions on spaces over $\mathbb{C}$ of dimension 1
        - circle packing Circle packing on $\mathbb{R}^2$
        - circle packing to Riemann map Circle packing converges to the Riemann biholomorphism
        - Cn conn open bounded Bounded connected open subsets of $\mathbb{C}^n$
        - Cn conn open circular Connected circular open subsets of $\mathbb{C}^n$
        - cont Continuous functions on $\mathbb{R}^d$
        - cube dyadic Dyadic cubes
        - curves Curves
        - derivative Differentiable functions
        - forms Differential forms on $\mathbb{R}^n$
        - Fourier-Wigner Fourier-Wigner transform
        - harmonic composed conformal Harmonic functions composed with conformal maps
        - Hilbert Hilbert transform
        - hol harmonic disk-circle Fourier-Cauchy-Poisson correspondence of holomorphic and harmonic functions on the unit disk and their boundary values
        - Hol sets Holomorphic subsets of $\mathbb{C}^n$
        - hypersurf 2n reg Regular hypersurfaces in $\mathbb{R}^{2n}$
        - hypersurf or Orientable hypersurfaces in $\mathbb{R}^n$
        - KG

$$\partial_t^2 + \sum_{i=1}^{n} v_i^2 \partial_{x_i}^2 + m^2$$

        - Laplace Laplace operator on $\mathbb{R}^n$
        - Lmeas Lebesgue measurable subsets of and functions on $\mathbb{R}^n, T^n, S^n$

- Lmeas bd of open Lebesgue measure of boundary of open sets in $\mathbb{R}^n$
- met density Metric density of subsets of $\mathbb{R}^n$
- Mobius n-sphere Mobius endomorphisms
- monotone Monotone functions on $\mathbb{R}$
- periodic int Cauchy Cauchy integral of periodic functions
- poly int Polygons with integer vertices
- R 2 open smooth End Open smooth maps $U \subseteq \mathbb{R}^2 \to \mathbb{C}$
- R n discrete subg Discrete subgroups of $\mathbb{R}^n$
- R n discrete subg cocpt Discrete cocompact subgroups of $\mathbb{R}^n$, flat tori
- RC ramified germs Ramified germs of smooth and holomorphic functions
- Rn open Open subsets of $\mathbb{R}^n$
- Rn open Riem Open subsets of $\mathbb{R}^n$ equipped with the flat metric
- smooth quasi-analytic Quasi-analytic smooth functions on $\mathbb{R}$
- star shaped Star-shaped subsets of $\mathbb{R}^n$
- Vec ODEs in $\mathbb{R}^n \leftrightarrow$ Vector fields in $\mathbb{R}^n$
- wave

$$\partial_t^2 + \sum_{i=1}^{n} v_i^2 \partial_{x_i}^2$$