Info

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Euler's iterative solution method for first order ODEs

For

$$y' = F(x, y)$$
$$y(0) = \alpha$$

we

Naive calculations

$$y(x+h) = y(x) + hF(x, y(x))$$

Definition. **Euler's iteration**

Divide $[0, L]$ into n partitions $x_i = ih, i \in \{0, \ldots, n\}$ of length h

$$y_0 := \alpha$$
$$y_{i+1} := y_i + hF(x_i, y_i)$$

[1]

convergence

Let

$$i \in \{0, \ldots, n\} \implies |E_{i+1}| \leq A^i |E_0| + B$$

then

$$i \in \{0, \ldots, n\} \implies |E_i| \le A^i |E_0| + \frac{A^i - 1}{A - 1} B$$

Let Y_k be the actual solution, then

$$E_k := Y_k - y_k$$

Now consider

$$\begin{aligned} |E_{k+1}| &= |Y_{k+1} - y_{k+1}| \\ &= |Y(x_k + h) - (y_k + hF(x_k, y_k))| \end{aligned}$$

Current note has 0 direct children and 0 total descendants.

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

And it has 10 siblings.

- 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 $\rightarrow$ 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 $\mathbb{R}^n$

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1. application.wiley-vch.de/books/sample/3527406107_c01.pdf ↩