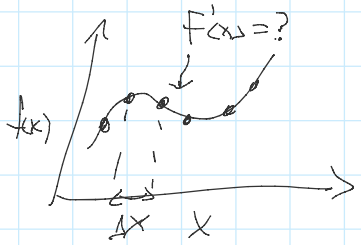
Week 1 - Friday

Friday, January 29, 2021 11:49 AM

Error Sources

- Discretization ($\Delta x \neq 0$)
- Truncation
- Precision

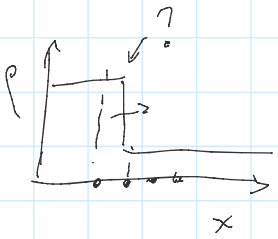


$$f(x), \quad f'(x) = \frac{f(x+\Delta x) - f(x)}{\Delta x} + \mathcal{O}(\Delta x^2)$$

Physical Systems where each might dominate:

Discretization

Fourier Transforms

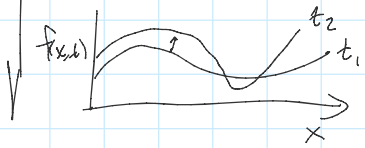


Truncation

Computing Taylor series

Time-stepping

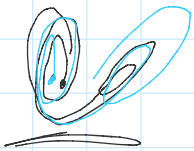
$f_{t+\Delta t} = f(t) + \Delta t \dot{f} + \mathcal{O}(\Delta t^2)$



Precision

Arithmetic

Chaotic Systems

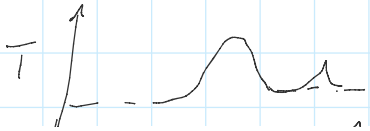


N-body

Coastline problem

Also important: Stability of algorithms

Ex: Inverse diffusion



another example:

recursion relations

(1, 1)

Recursion relations

(Lab)