

Week 4

# **PHY 110C**

## **Introduction to Data Analysis for Physics**

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# Overview

- Presentation of Solutions
- Discussion of Problems
- Overview of Reading
- Assignment 4

# Solution Presentations

# Common Problems / Points for Discussion

- Problem 1 - few problems
- Problem 2
  - Order in space  $\neq$  order in lists
  - $\text{sum}(\text{norm}) \neq \text{norm}(\text{sum})$
  - No real reasoning for Y/N on momentum conservation (order of magnitude change, what is considered significant)

# Math!

- Starting to apply more math to *Mathematica*
- Few additional strictly programming topics for *Mathematica* now
- Not sure on background - I'm here for questions

# Least-Squares / FindFit

- Least-Squares is extremely powerful
  - Not just for linear approximation
  - Math in the textbook
- Method to fit multivariate data to function to get parameters
- FindFit takes in data, model, parameters, and variables to do this (or other curve-fitting technique)
- Examples in Mathematica...

# Interpolation/Extrapolation

- Interpolation: use fitting function to guess at data value between actual data values.
- Extrapolation: use fitting function to guess at data value outside data range.
- Interpolation[...]

# Taylor Series

- That thing from calculus...
- Heavily-utilized in physics (often first-order)

$$f(x) = \sum_{i=0}^{\infty} \left( \frac{(x - x_0)^i}{i!} \frac{d^i f(x)}{dx^i} \Big|_{x=x_0} \right)$$

- Series[ function, {var, start, order}]
- More math in textbook



# Assignment 4

- [http://www.cs.utexas.edu/~evanott/PHY110C\\_Textbook/static/data\\_analysis/\\_downloads/assignment4.pdf](http://www.cs.utexas.edu/~evanott/PHY110C_Textbook/static/data_analysis/_downloads/assignment4.pdf)