Week 3

PHY 110C

Introduction to Data Analysis for Physics

Overview

- Presentation of Solutions
- Discussion of Problems
- Overview of Reading
- Assignment 3

Solution Presentations

Common Problems / Points for Discussion

- Problem 1 - Style[“text”, Orange, …]
  - Plot vs. ListPlot for function vs. data
  - Symbols can’t be plotted
  - Capitalization
- Problem 3 - Plotting lists
  - ListLinePlot[{ {90, 100, 50}, {50, 10, 40} }]
  - ListLinePlot[{{90, 50}, {100, 10}, {50, 40}}]
  - First plots two different lists with first coordinate assumed to be the index
  - Second plots single list with each point given

Common Problems / Points for Discussion

- Problem 2 - Table[f[x], {x, start, end, step}]
  - Intended to show manipulation of data in a table, learn some properties of binomial coefficients (failure in description on my part)
  - ex: Table[data[[i, i;;i+2]], {i, 1, k}]
  - Extra credit

Importing Data

- Import[“filename”] pulls data into a matrix
- data = Import["http://www.cs.utexas.edu/~evanott/PHY110C_Textbook/static/data_analysis/_downloads/without.csv"];
  ListPlot[data]
- Many known filetypes (CSV, txt, XLS, PNG)
- Great for interfacing with data collection software
- ReadList[“file”, specialOptions] for less common formats - see textbook

Exporting Data

- Export[“filename”, expression] creates a file representative of expression
- Can export data as a table (CSV, txt, XLS)
- Can export images (PNG, JPG, GIF)
- Can export animated images (see textbook)
- Export["test.png", Plot[x^2, {x,-4,4}]]; Import ["test.png"]

3D Graphs and More

- http://www.cs.utexas.edu/~evanott/PHY110C_Textbook/static/data_analysis/Mathematica/functions_graphs.html#basic-3d-graphs

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Animations

- Manipulate[expr, {var, start, finish, step}] lets you manually vary *var*
- Animate[expr, {var, start, finish, step}] is same, but will do so automatically
- Both useful for looking at data (estimating a fit by hand?), but not for presentation (CDFs aren't widely accepted)

Assumptions

- Motivation: some functions can simplify if they know more
- Ex: Integrate
  - Integrate[Exp[x^k], {x, 0, 1}]
  - Integrate[Exp[x^k], {x, 0, 1}, Assumptions->{k > 1}]
- Better example: hydrogen atom (see book)

Assignment 3

- http://www.cs.utexas.edu/~evanott/PHY110C_Textbook/static/data_analysis/_downloads/assignment3.pdf