

PHYS 399, Homework #3
Due Monday, May 4, start of class.

Key Concepts

- Weighted Mean
- Least Squares Fitting

Reading: Taylor Chapters 7-8

Homework Problems (taken from Taylor):

1. Problem 7.1 - Please work this out “by hand.” There aren’t that many values, and it is good to see exactly how this works at least once.
2. Problem 7.7
3. Problem 7.8
4. Write a short MATLAB function to read in a set of values with errors from a text file and compute the weighted average and the uncertainty on the weighted average. Write down the formula(e) you are using and prove to me that it works by producing results for the data in problems 7.1, 7.2, and 7.4. I don’t need to see your exact code, however. The text file can have any format you wish, although the easiest is probably to have one entry per line with value followed by uncertainty. This can easily be read with the `load` or `dlmread` commands.
5. Problem 8.1 - Do this “by hand” first, then compare with the MATLAB function `polyfit(x, y, 1)` which does a least-squares fit to a 1st order polynomial. Alternately, if you just plot the data, from the plot menu bar you can choose *Tools:Basic Fitting* and get the same result. See section 5.2 in Pratap for more information.
6. Problem 8.5
7. Problem 8.10 - Here you can do the weighted fit any way you want. Either by hand, by performing the calculations in MATLAB, or perhaps most useful try to learn the built-in MATLAB functions to do this. To fit weighted data, you need to use both the `fit` command and the `fitoptions` command. Note that `fitoptions` allows you to specify a vector of *weights* not errors. One benefit of using `fit` is that it returns the uncertainty (quoted at 95% confidence level) on the fit parameters.
8. Problem 8.18