

Homework Assignment 2

Due: Monday September 21, 11:59 pm, UBlerns Digital Dropbox

PHY 410: choose any two problems. PHY 505: work all three problems

1. Download <http://nssdc.gsfc.nasa.gov/planetary/factsheet/cometfact.html> (NASA's Comet Fact Sheet on 20 selected comets) and fit this data to Kepler's third law. Use the fit to estimate $G_N M_\odot$ and compare with G_N and M_\odot values listed in most physics textbooks. Download the full comet orbital element table from JPL http://ssd.jpl.nasa.gov/?sb_elem. Compute T for each comet using Kepler's third law and try to find a simple model numerically that relates the period T to the semiminor axis b instead of the semimajor axis a . When you are looking for a model it helps to start by simply plotting the data!

<http://www.physics.buffalo.edu/phy410-505/topic1/lec-1-4.pdf>

2. Explain why the data in Fig. ?? does not fit the Gutenberg-Richter Law over the whole range of M values in the figure. Fix the program to obtain a more reliable estimate of the slope constant b . Download a different event data set (from Ref.[?], or the Southern California Earthquake Center <http://www.scec.org/resources/data/>, or any other source you can find on the Web), perform a linear fit and compare your results with the set in Fig. ??.

<http://www.physics.buffalo.edu/phy410-505/topic1/lec-1-5.pdf>

3. The Mauna Loa CO_2 concentration increases with every passing year in addition to oscillating with the seasons. To Fourier analyze the seasonal oscillation, the linearly increasing trend needs to be subtracted from the data. Fit the concentration data to a quadratic function of time $f(t) = a_0 + a_1 t + a_2 t^2$ using a general linear fit routine. Is the linear increase accelerating or decelerating? If the current trends continue, when will the concentration reach toxic levels? Next, subtract the fit function $f(t)$ from the data. Plot the subtracted data and its power spectrum. Compare with the original plots and interpret your results.

<http://www.physics.buffalo.edu/phy410-505/topic1/lec-1-6.pdf>