# Lab 1: Graphical Analysis

Experiment for Physics 211 Lab at CSU Fullerton.

##  What You Need To Know

## What You Need to Do

### Step 1 – Linearizing An Equation

#### Exercise #1

Do the following for each of the following questions

1. “massage” the equation into linear form
2. identify in the linearized equation your ***y***, ***m***, ***x***, and ***b***

The resonant frequency, $ω$, of a parallel L-C circuit is given by:

$$ω=\frac{1}{\sqrt{LC}}$$

$ω$ and $C$ are measured variables, where $ω$is the independent variable, $C $is the dependent variable, and $L$ is held constant.

The linear expansion of a solid,$l$, is described by:

$$l=l\_{0}\left(1+αΔT\right)$$

$l$ and $ΔT$are measured variables. $l\_{0}$and $α$ are constants.

A conical pendulum has a period,$ T$, given by:

$$T=2π\sqrt{\frac{l\left(cosθ\right)}{g}}$$

$T$ and $θ$ are measured variables, where $θ$ is the independent variable. $l$ and $g$ are constants.

 The wavelength, $λ$, of the light in the Balmer series of the spectrum of the hydrogen atom is given by:

$$\frac{1}{λ}=B\left(\frac{1}{4}-\frac{1}{n^{2}}\right) $$

$λ$ and ***n*** are measured variables, where $n$ is the independent variable. $B$ is a constant known as the Rydberg constant.

### Step 2 – Determining Axes and Modifying Data Table

### Exercise #2

|  |
| --- |
| Variables |
| n | $λ$ (m) |  |
| 3 | $$6.56×10^{-7}$$ |  |
| 4 | $$4.86×10^{-7}$$ |  |
| 5 | $$4.34×10^{-7}$$ |  |
| 6 | $$4.10×10^{-7}$$ |  |
| 7 | $$3.97×10^{-7}$$ |  |

Based on your results from **Problem #4** in **Exercise #1**, state how you are going to graph your data on the x-axis and the y-axis.

Based on your answer to Question 5, modify your data table (like in the *example* in **Figure 3b)** so that when you make your graph you will get a straight line. Do not leave your data in fraction form. Use a calculator or excel to get a decimal number.

Put the new modified column(s) directly into Table 1.

### Step 3 – Plotting Your Data

Plot the data from exercise 2 by hand on the graph paper provided by your instructor. Be sure to follow the instructions in step 3.

### Step 4 – Finding Your Slope and Constant

#### Exercise #4

Start by drawing your BFL using the clear ruler on your table.

Based on your BFL, calculate the slope of the line.

Use your slope to calculate the Rydberg constant, ***B***, based on your linearized equation from **Problem #4** in **Exercise #1**.

Calculate a percent difference by comparing your calculated value to the actual value of 1.097 x 107 m-1.

### Step 5: Your Turn

Using the trendline (A.K.A. Best Fit Line) determine the constant, ***g***, whose value is 9.8 m/s2.

Calculate a percent difference.

Adjust the graph based on what you’ve learned in a good graph should have. Note for excel graphs we also want axis titles and a good chart title. Submit your final polished graph and table by copying and pasting into your report below this question. The table you can just select and ctrl-c, ctrl-v.

For your graph, when you paste it don’t ctrl-v, right click and select the paste as picture option as shown in Figure X, this will avoid any formatting issues.

## Conclusion

Follow the lab report guide to write a conclusion on this lab. Focus on just step 5 for this conclusion.

Conclusion