Week 0: Error Propagation and Using Excel's "Solver"

Name:_____

Installing/activating Solver in MS Excel 2013:

1. **From any open document, click the "File Tab".**
2. **Go to "Options" at the bottom left.**
3. **Choose "Add-Ins" at the bottom.**
4. **Click the GO button at the bottom center.**
5. **Select the "Solver" add in (and any others you want).**
6. **To use Solver after it has been activated, choose the "Data" menu; solver is now way over on the right side.**

time (ms)	position (mm)
0.0	130
0.1	140
0.2	149
0.3	158
0.4	167
0.5	175
0.6	183
0.7	191
0.8	198
0.9	205
1.0	209
1.1	215
1.2	219
1.3	222
1.4	225
1.5	226
1.6	226
1.7	227
1.8	227
1.9	227
2.0	228

Assignment (also, make sure you see the other side, too!)

1. Enter this data set.
2. Plot it. Have labels as appropriate. Note that as always, measured data points should have dots/markers but NO connecting lines.
3. Use Solver to find the equation of the best fit line for this data: $x = b + mt$. Record all answers in the appropriate box below using three sig figs.
4. Then find the best fit parabola: $x = a_0 + a_1 t + a_2 t^2$.
5. Then find the best fit exponential: $x = C_1 + Ae^{kt}$ (force $C_1 > 0$).
6. Then find the best fit sine wave: $x = C_2 + B\sin(\omega t)$. For this case, you probably need reasonably good starting guesses (all parameters positive).
7. Report your results below for the various constants you've found. Use 3 sig-figs for each. Hint: most of these constants are numbers *with units*. Excel only tells you the number part, but *you* must tell me both.
8. All of these fits were found using the method of least squares. Which of these four fitting methods gave the "best" results? How do you know?
9. Add *only the best* of these fits to your plot and reformat it to make sure it uses only the top 3rd of a sheet of paper. Don't print it yet.

b =		
m =		
error^2 =		

a_0 =	C_1 =	C_2 =
a_1 =	A =	B =
a_2 =	k =	ω =
error^2 =	error^2 =	error^2 =

*Which fit is best?*_____

*How do you know?*_____

_____

10. Consider the following plots. In each case, circle the features that should be improved, and annotate each of your circles with a number corresponding to the "Rookie mistake" that it represents.
11. Choose any two of the first 4 plots shown here, and then replot them in a more appropriate way on the same sheet as before (see above steps 2 and 9). I don't want to see data, just plots. You may have to adjust margins, etc. as well as the individual plots. You can find the original data online at: http://www.geneseo.edu/~pogo/OpticsLab/PlottingRawData.xls
12. Staple your **one** extra sheet having 3 plots on it to this worksheet, and turn it in next week. Do not ask your instructor for a staple.