

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

Name: _____

Installing/activating Solver in MS Excel 2007 or 2010:

1. Click the colored round "Office" button (or the "File Tab")
2. Go to "Excel Options" at the bottom.
3. Choose "Add-Ins", then wait a moment.
4. Click the GO button at the bottom.
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

1. Enter this data set.
2. Plot it. Have labels as appropriate. Note that 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 using three sig figs.
4. Then find the best fit parabola: $x = a_0 + a_1t + a_2t^2$.
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 (consisting of a line without markers), and staple it to this sheet. Yes, you really have to use a staple. No, you can't use mine because you forgot.

Your Results:

$a_0 =$	$C_1 =$
$a_1 =$	$A =$
$a_2 =$	$k =$
$\text{error}^2 =$	$\text{error}^2 =$

$b =$
$m =$
$\text{error}^2 =$
$C_2 =$
$B =$
$\omega =$
$\text{error}^2 =$

Which is best? _____

How do you know? _____
