

Excel: Using LINEST function, Plotting a graph, Adding Error Bars

Raghav K Chhetri

01/24/2009

Using LINEST function

- Lets start with a table for time and velocity as shown on the right.
- LINEST function returns several outputs, so to begin with, select a 2 by 5 array as shown.

Table 1: Time and Velocity Data			
time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9

Using Linest function:

NOTE: I mistakenly put (m) for the unit of time.

Under the Insert Tab, select Function. Then, make the selections as shown below. Hit OK.

The screenshot shows the Microsoft Excel interface with the 'Insert' tab selected. The 'Paste Function' dialog box is open, displaying the 'Statistical' category and the 'LINEST' function. The background spreadsheet contains a table of time and velocity data.

Table 1: Time and Velocity Data

time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	
3.7	0.3	7.7	
4.9	0.2	9.8	
6.9	0.4	12.3	
8.3	0.6	15.7	
11.5	0.9	16.2	
13.3	0.8	17.2	
17.9	0.3	18.9	
20.3	0.6	25.3	

Using Linest function:

=

Paste Function Dialog Box:

- Function category: Statistical
- Function name: LINEST
- Function description: LINEST(known_y's,known_x's,const,stats)
- Returns an array that describes a straight line that best fits your data, calculated by using the least squares method.

[Click for Help on the selected function.](#) [Cancel] [OK]

Select the y-values and x-values from the table.


LINEST

Known_y's	C4:C12	= {5.5;7.7;9.8;12.3;1
Known_x's	A4:A12	= {2.5;3.7;4.9;6.9;8.1
Const	TRUE	= TRUE
Stats	TRUE	= TRUE

= {0.93787618833324,4.98307

Returns an array that describes a straight line that best fits your data, calculated by using the least squares method.

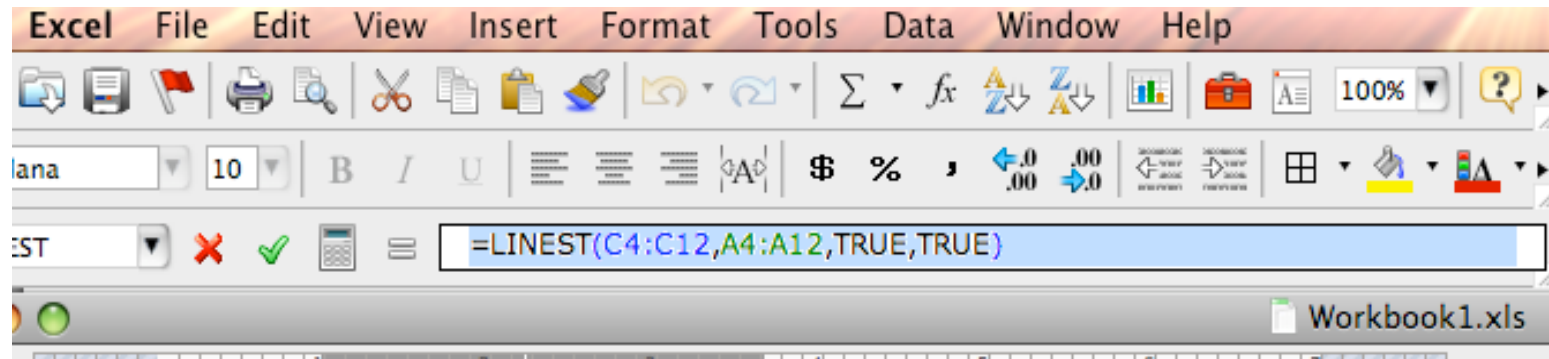
Stats is a logical value: return additional regression statistics = TRUE; return m-coefficients and the constant b = FALSE or omitted.

 Formula result = 0.937876188

Cancel OK

Write 'TRUE' for the last two boxes. Hit OK.

Now, highlight the formula in the formula bar.



Press Ctrl+Shift simultaneously and hit Enter (Mac users, press Command and hit Enter)

Linest Function

- The array we selected earlier is now filled with numbers as shown to the right
- Lets see what some of these numbers mean

Table 1: Time and Velocity Data			
time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9
Using Linest function:			
	0.937876188	4.983072931	
	0.102847501	1.188614381	
	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

Linest Function

Table 1: Time and Velocity Data			
time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9
Using Linest function:			
Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R^2 Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	
Thus,			
Acceleration (slope of velocity vs time curve) is:			0.9 +/- 0.1 m/sec^2
Velocity at t=0 (y-intercept) is:			5 +/- 1 m/sec

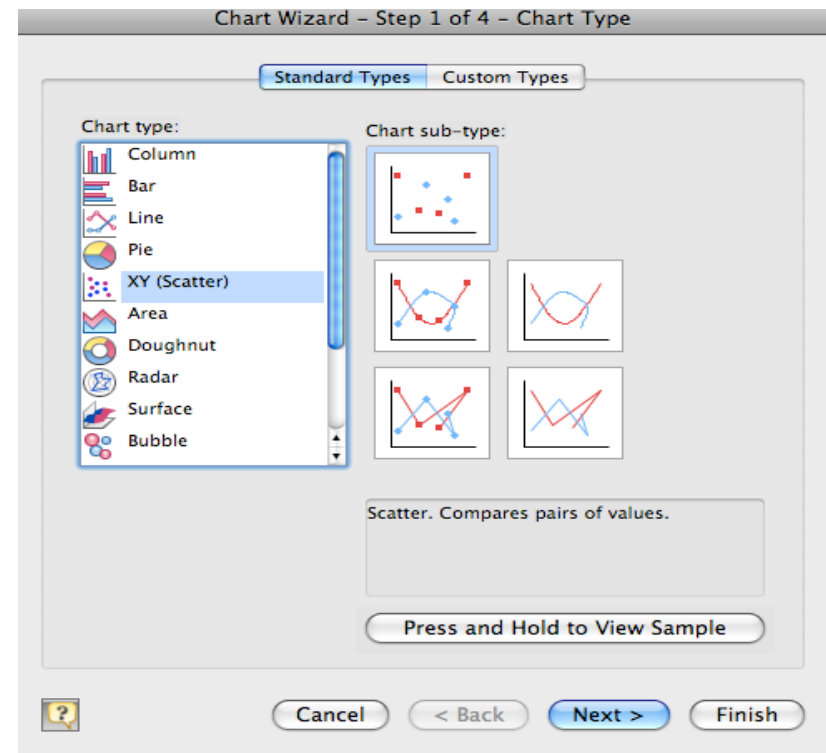
Plotting a graph

- Select the x-column first. Hold down the CTRL key and select the y-column next.
- Choose XY scatter, under subtype, select the first one as shown

Table 1: Time and Velocity Data			
time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9

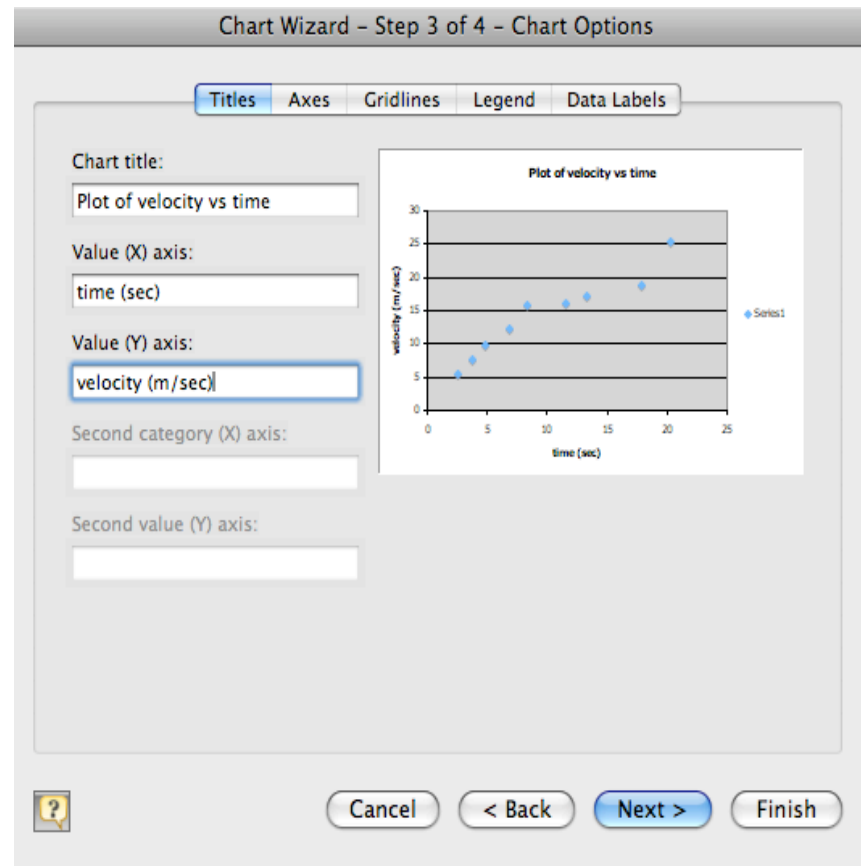
Using Linest function:			
Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R^2 Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

Thus,			
Acceleration (slope of velocity vs time curve) is:	0.9 +/- 0.1 m/sec^2		
Velocity at t=0 (y-intercept) is:	5 +/- 1 m/sec		

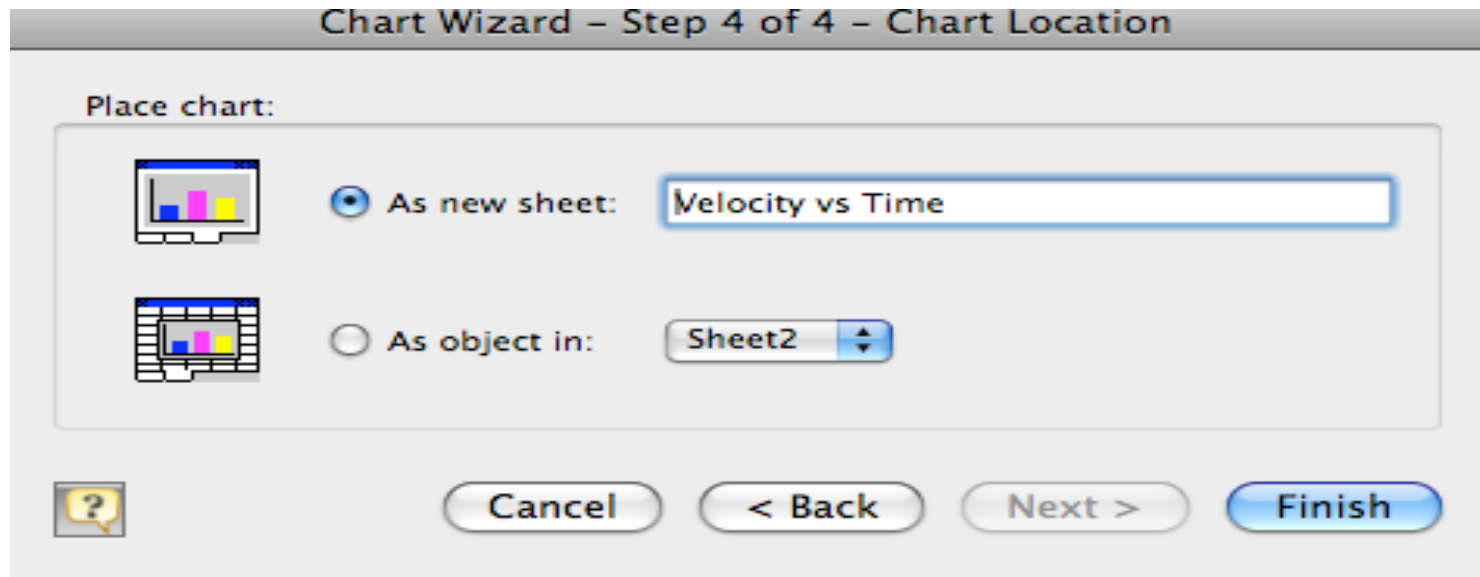


Plotting a graph

- Give an appropriate title to the graph
- Label the axes (Don't forget the UNITS!!)

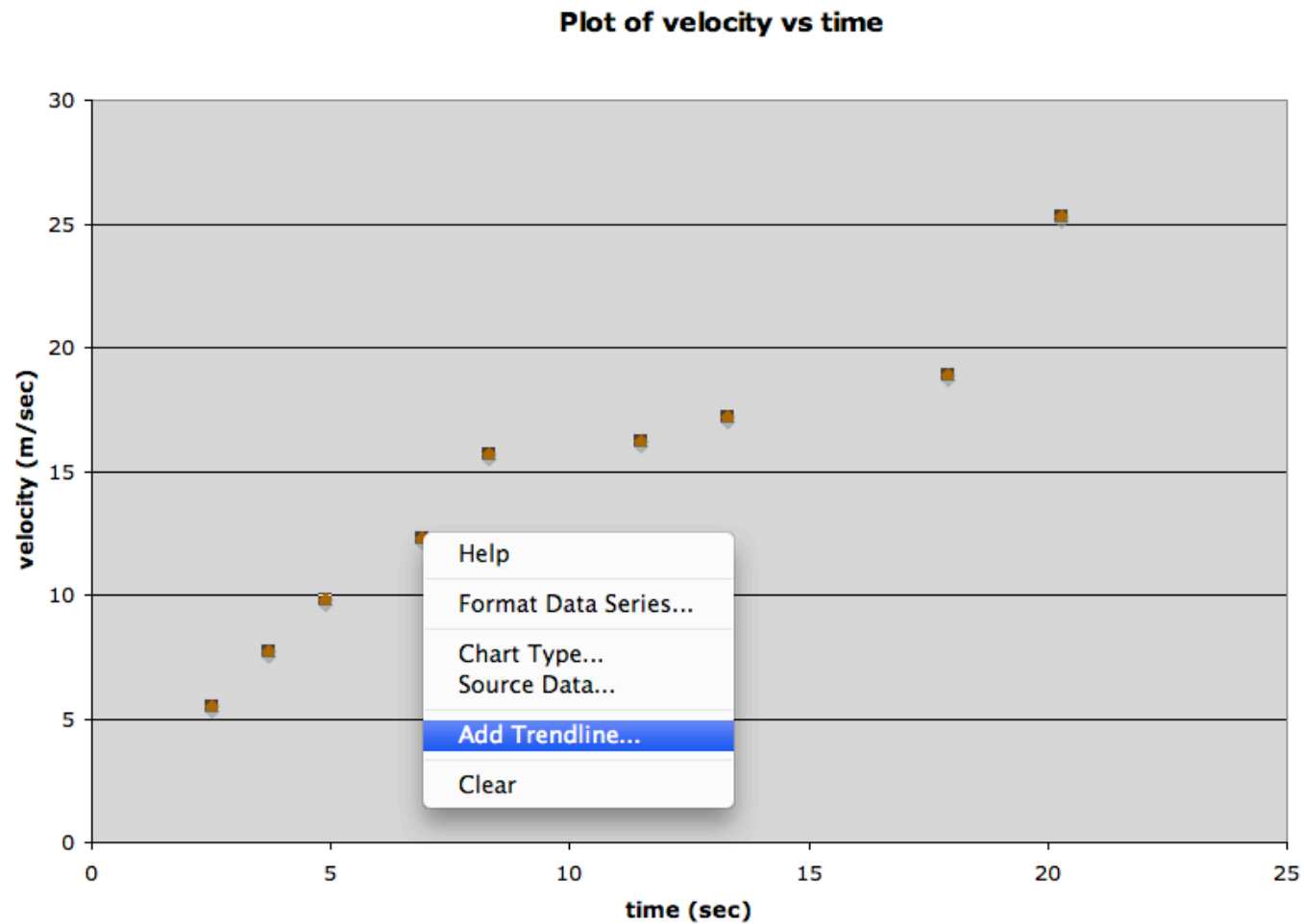


Plotting a graph



- Select 'As new sheet'. Name the sheet appropriately.

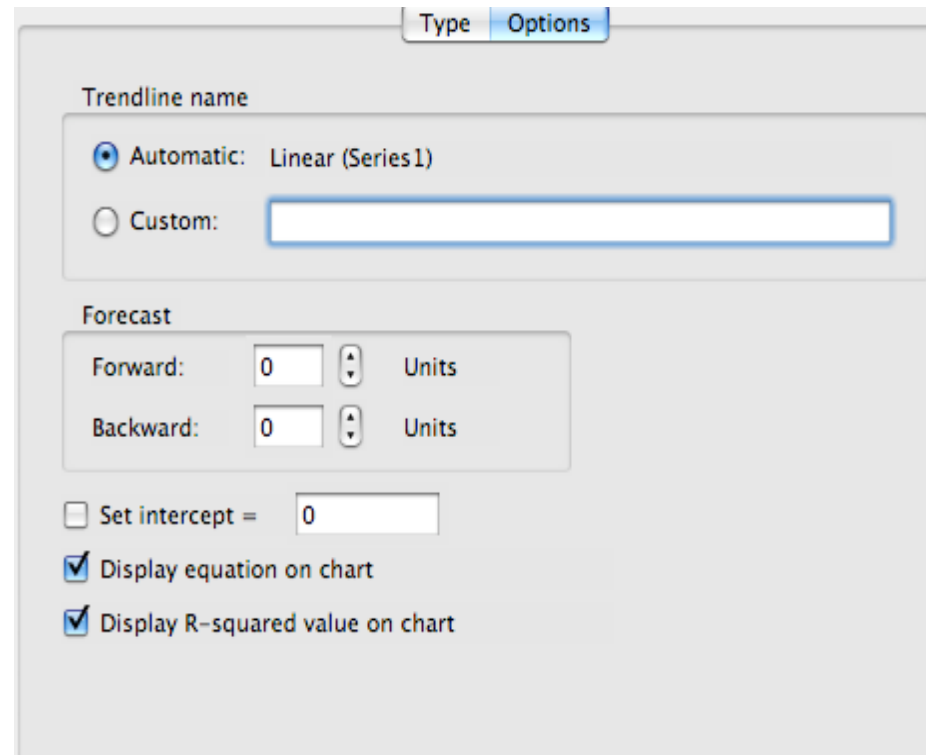
Plotting a graph



- Highlight the data points, select 'Add Trendline'

Plotting a graph

- Choose 'Linear' under 'Type'
- Select the options to display equation and R^2 value on chart

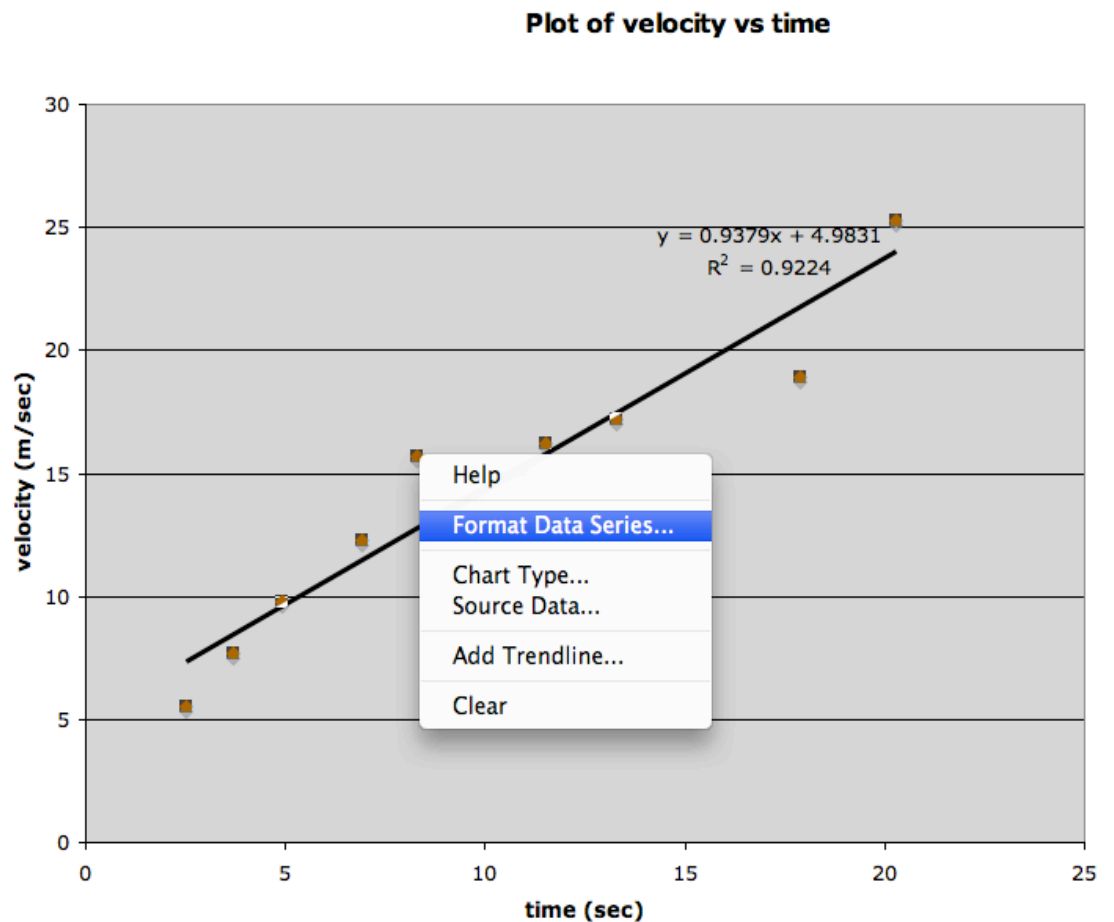


The screenshot shows the 'Options' tab of a trendline dialog box. The 'Trendline name' section has two radio buttons: 'Automatic: Linear (Series1)' which is selected, and 'Custom:' followed by an empty text box. The 'Forecast' section contains two rows: 'Forward:' with a value of 0 and 'Units' dropdown, and 'Backward:' with a value of 0 and 'Units' dropdown. Below this, there is a checkbox 'Set intercept =' with a value of 0. At the bottom, there are two checked checkboxes: 'Display equation on chart' and 'Display R-squared value on chart'.

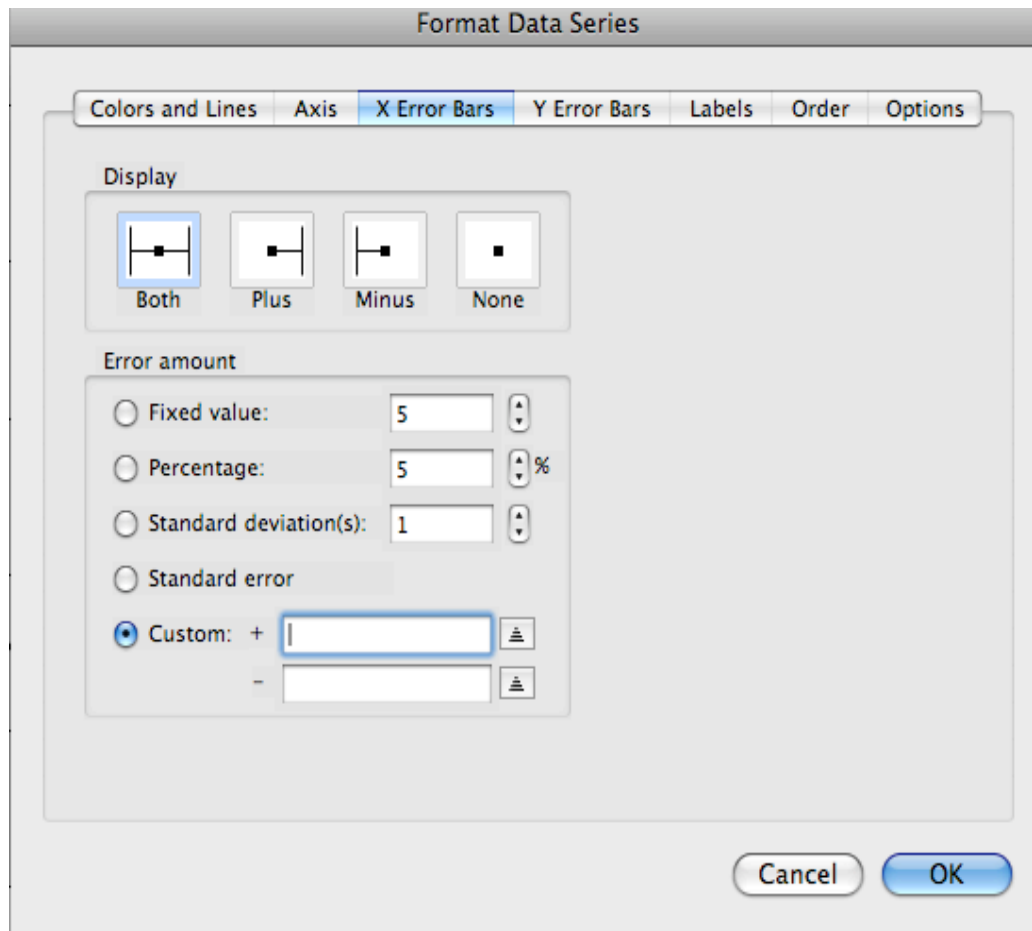
Adding Error Bars

Now that we have the plot, lets add the error bars.

- Select the data points and right click
- Select 'Format Data Series'



Adding Error Bars



- Click on the 'X Error Bar' tab
- Select 'Both'
- Under 'Custom', click on the widget on the right of the + box
- Go back to the data sheet and select the uncertainty in x-values (next slide)

Adding Error Bars

Table 1: Time and Velocity Data

time (m)	uncertainty in time	velocity (m/sec)	uncertainty in velocity
2.5	0.1	5.5	0.3
3.7	0.3	7.7	0.2
4.9	0.2	9.8	0.7
6.9	0.4	12.3	0.9
8.3	0.6	15.7	0.2
11.5	0.9	16.2	0.3
13.3	0.8	17.2	0.6
17.9	0.3	18.9	0.6
20.3	0.6	25.3	0.9

9R x 1C

Using Linest function:

Slope	0.937876188	4.983072931	Y-intercept
Slope Uncertainty	0.102847501	1.188614381	y-intercept uncertainty
R^2 Value	0.922358443	1.828360018	
	83.15790383	7	
	277.9885864	23.4003025	

Thus,

Acceleration (slope of velocity vs time curve) is: $0.9 \pm 0.1 \text{ m/sec}^2$
 Velocity at t=0 (y-intercept) is: $5 \pm 1 \text{ m/sec}$

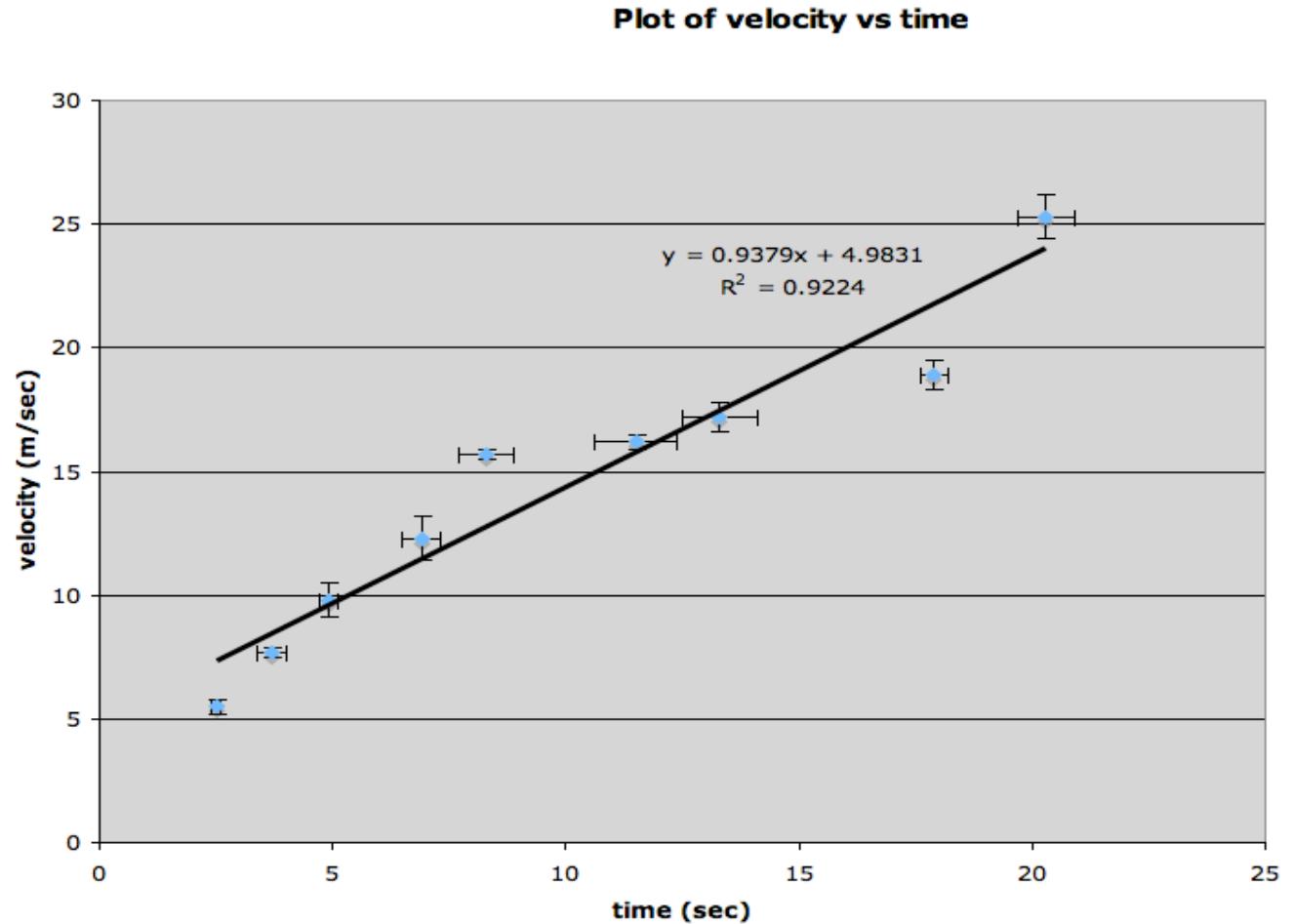
Format Data Series

=Sheet2!\$B\$4:\$B\$12

- Select the uncertainty as shown, then click on the widget on the right
- Repeat the same for the - box once done with the + box
- This adds the error bars in the X-direction

Adding Error Bars

- Repeat the same procedure for putting error bars in the Y direction
- Once done, your graph should look as shown to the right



The End.