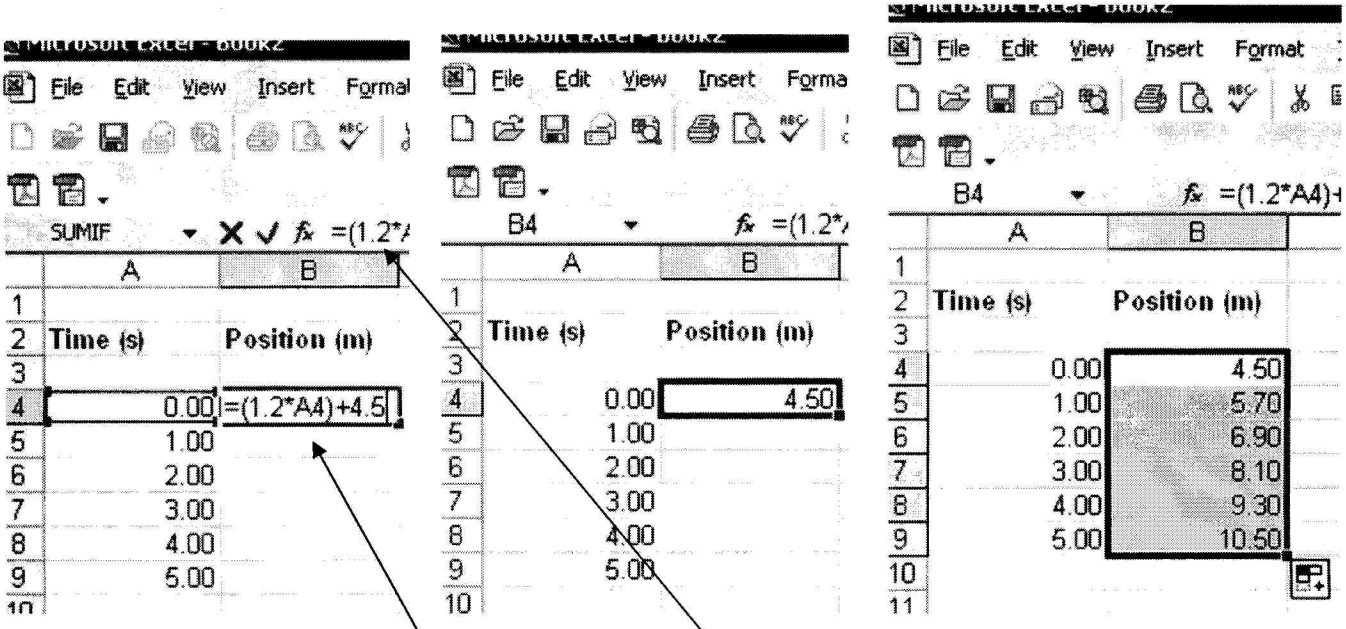
Excel Basics

Entering text and equations

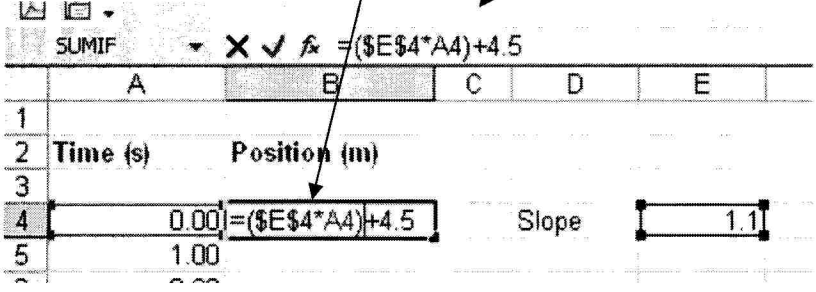
- To enter text or data, click on a cell with the mouse. Type **enter** to accept your entry, and **backspace** to correct it.
- To enter equations, click on a cell with the mouse. Equations are preceded by an = sign. In the example below, the equation in cell **B4** multiplies **1.2** by the value in cell **A4** and adds **4.5** to it. To apply the same equation to all values in column **A**, click and hold the mouse on the square on the bottom right hand corner of the black box outlining **B4** and drag it down and then release. That will multiply **1.2** by **A4** through **A9** and add **4.5** to each cell.



- Equations appear in the cell and in the function box above the worksheet.

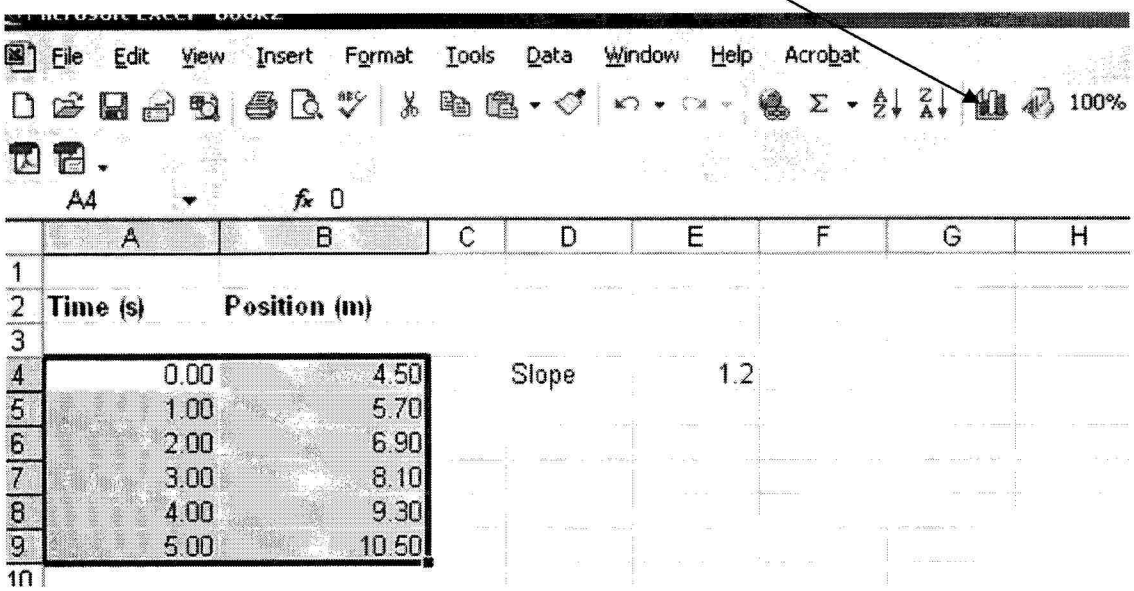
Constants

- If you wanted to change the slope in the example above from 1.2 to 1.1, and didn't want to have to redo all of the above, the solution is to use a constant. Constants are referenced differently than normal values by placing a **$** sign in front of the cell's row and column (in the example below, **E4** refers to the constant in cell **E4**).

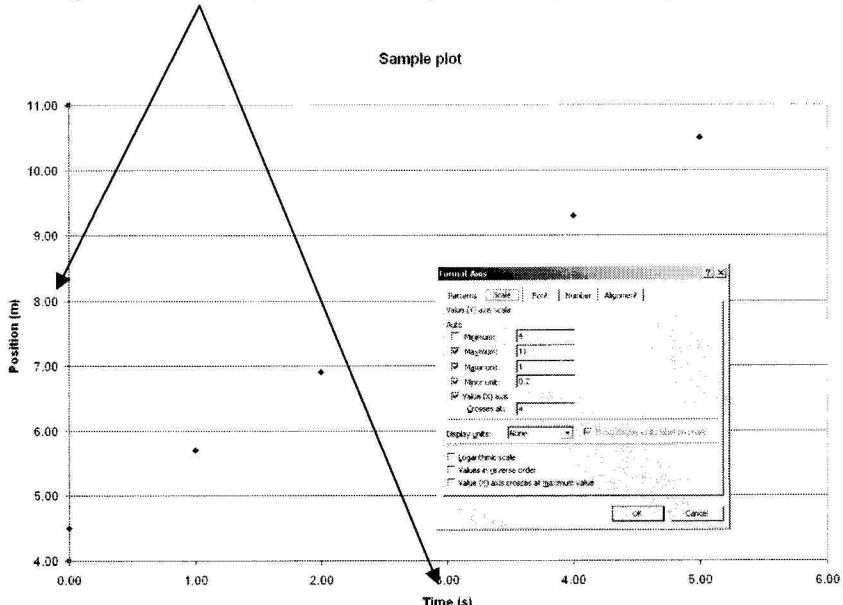


Plotting Data

- To plot a set of data (such as the time-position data shown on the previous page, highlight both rows with the mouse.
- Click on the graph icon to start the Chart Wizard.

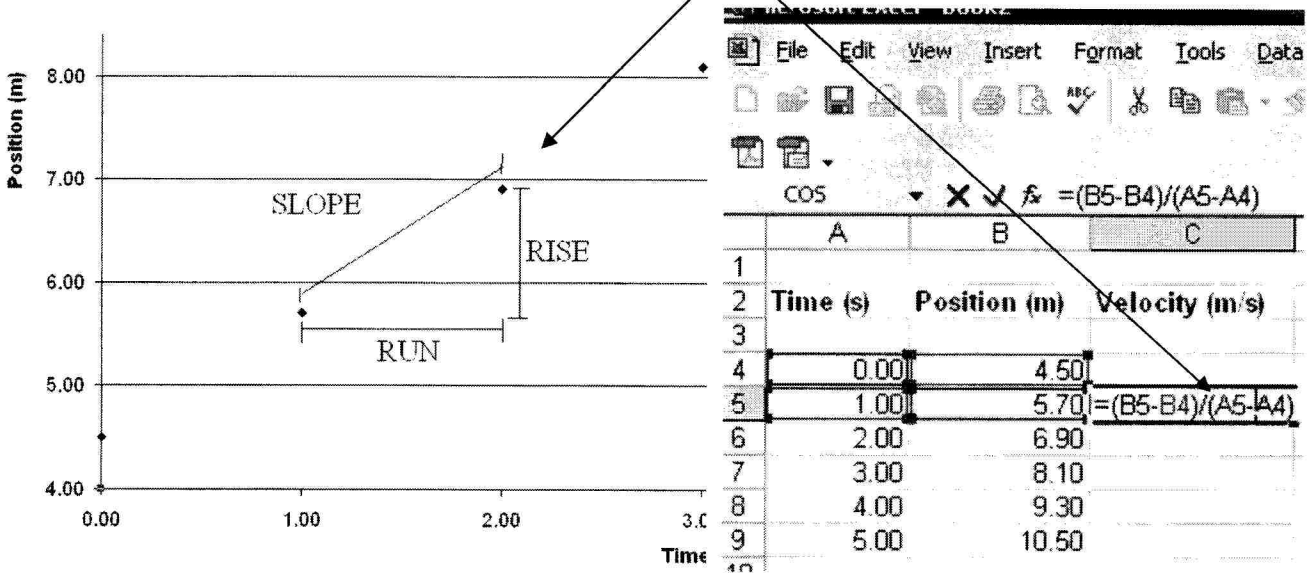


- In **Step 1**, highlight **XY (Scatter)** and click **Next**.
- In **Step 2**, click **Next**.
- Enter the chart title, and the x-axis and y-axis titles in **Step 3**. Then click **Next**.
- Tick **As new sheet** and click **Finish**.
- The plot will appear as its own sheet (to switch between sheet, click the tabs at the bottom of the screen). Click the right mouse button overtop of the plot and select **Format Plot Area**. Under **Area**, change the background color to white (to save ink).
- By double-clicking on the axes, you can change the range of the plot.



Rise over run – poor man's derivative

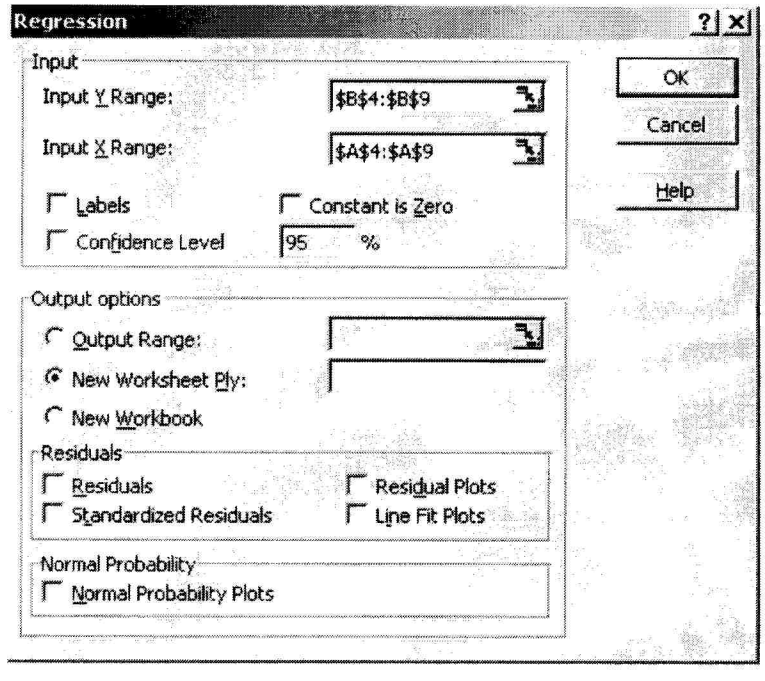
- With discrete data, to calculate a derivative, we determine the rise over the run to get the slope between two points of data.
- Slope = change in y / change in x = $(y_2-y_1)/(x_2-x_1)$



- For each derivative you calculate, you will lose one element in your array (i.e. if you have 5 position values, you will only have 4 velocity values, and only 3 acceleration values). That is because we are calculating the difference between two values and if you have N values, you will only have N-1 differences.

Linear regression

- if you have two sets of data that have a linear relationship between them, you can use **linear regression** to determine the slope and intercept for the data.
- To use linear regression, go to **Tools -> Data analysis** and pick **Linear Regression** from the list
- Input y-range and x-range and click **ok**

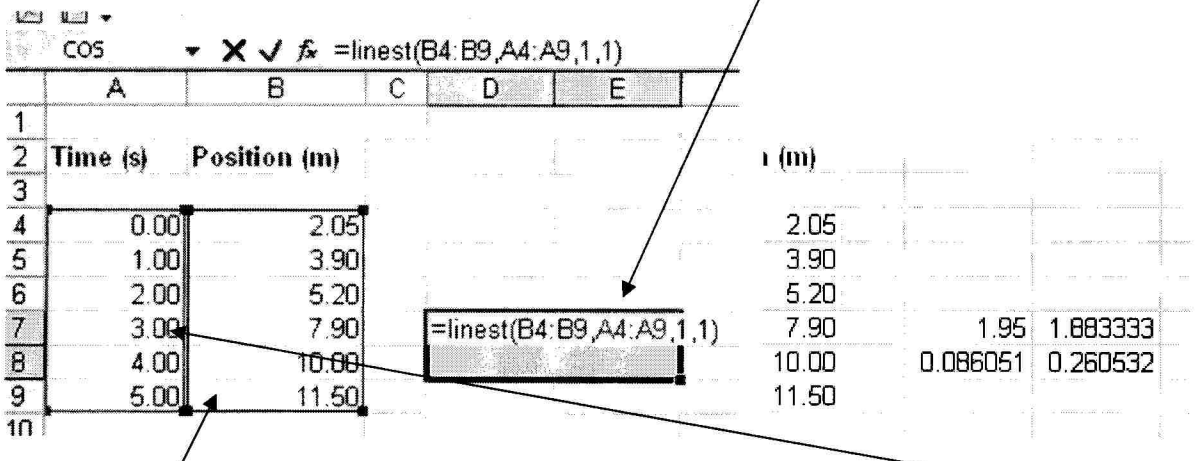


The output is on the right. **X Variable 1** is the slope and **Intercept** is the y-intercept. The adjacent numbers in the next column are the standard errors in slope and intercept.

	A	B	C	D	E
1	SUMMARY OUTPUT				
2					
3	*Regression Statistics*				
4	Multiple R	1			
5	R Square	1			
6	Adjusted R Square	1			
7	Standard Error	2.03507E-15			
8	Observations	6			
9					
10	ANOVA				
11		*df*	*SS*	*MS*	*F*
12	Regression	1	25.2	25.2	6.08472E+30
13	Residual	4	1.65661E-29	4.14152E-30	
14	Total	5	25.2		
15					
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*
17	Intercept	4.5	1.47288E-15	3.05524E+15	6.88601E-62
18	X Variable 1	1.2	4.86475E-16	2.46672E+15	1.62058E-61
19					
20					
21					
22					
23					

Slope and Intercept (an alternate to Linear regression)

- if you have two sets of data that have a linear relationship between them, you can use linest to determine the slope and intercept for the data.
- To use linest, highlight a 2 cell by 2 cell box and type **linest(**

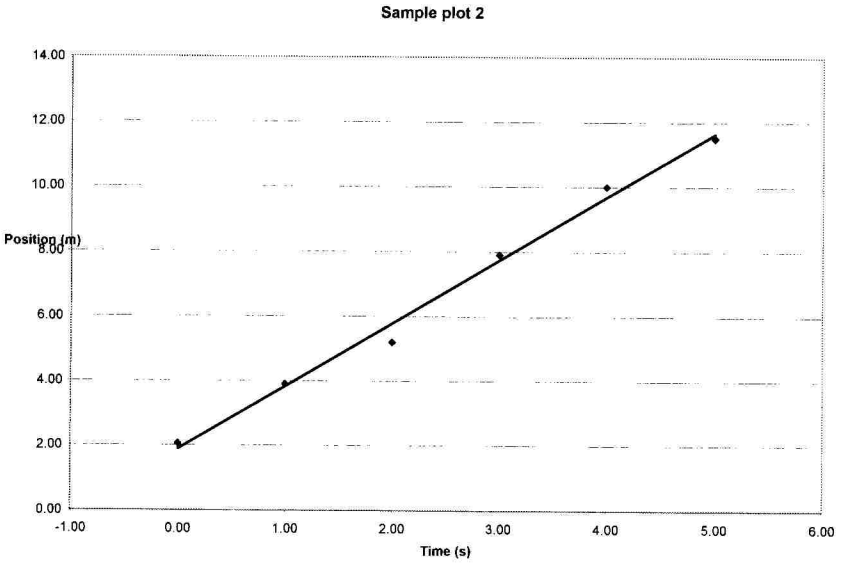


- Highlight the y data (the dependent data), add a comma, and then highlight the x data (the independent data). Add **,1,1)** and hold down **Ctrl** and **Shift** and type **enter**.

- The 2 cell by 2 cell box will now be filled. The first column contains the slope with its error (in this example, 1.95 +/- 0.086) and the second column contains the intercept and its error (in this example, 1.88 +/- 0.260).

Adding a linear fit to a plot

- in the chart window, highlight one of the data points and click the right mouse button. On the pop-up menu, click **Add Trendline**.
- Highlight **Linear** and click **OK**.



Common functions

- To calculate the average of a set of data, enter **=average(** and then highlight the cells you want to average. Add a **)** and hit **enter** (e.g. **=average(A4:A9)**).
- Other common functions
  - =sum(A4:A9) – calculated the total value of the selected cells
  - =stdev(A4:A9) – calculates the standard deviation of the selected cells
  - =sin(2.34) – calculates the sine of the value, where the input is in radians
  - =acos(2.34) – calculates the arcos of the value, returning an angle in radians
  - =log10(2.34) – calculates the base 10 logarithm of the value