PHY180F 2005 ASSIGNMENT 1
Due: Mon. Sep. 19 or Tue. Sep. 20 or Fri. Sep. 23
(In the first 5 minutes of your tutorial)

1) Download DataStudio from http://www.pasco.com onto your personal computer. Let us assume that you have downloaded DataStudio.
If you are using Microsoft Explorer: Click on the link, Assignment1Problem1 on the Assignments page or on the News page (http://faraday.physics.utoronto.ca/PHY180F/Assignment1Problem1.ds) and the DataStudio session will start.
If you are using Netscape: Right click on the link and save (depending on your version of Netscape you will get a message like "Save Link Target as …") the DataStudio file on your computer. Start a DataStudio session and open the activity (file) that you have just saved.

When you start DataStudio it wants to know which interface was used to create the data in the laboratory. Choose the 750 interface. Note that you don't actually need an interface because you will not be taking data but only modifying data.
The data in this problem is for a collision between two gliders on an air track in your laboratory. Glider 1 of mass 224 g is sensed by motion sensor 1 which is connected to Channels 1&2 of the 750 interface. Glider 2 of mass 222 g is sensed by motion sensor 2 which is connected to Channels 3&4. The motion sensors are at opposite ends of the track.

a) Display the velocities of glider 1 and 2 on the same graph. By default, motion away from the sensor is positive. Describe in words what is happening in this run and why the graphs appear as the do?
b) Click on the "Calculate" button on the main toolbar (between "Stop" and "Curvefit") and calculate the total kinetic energy $y = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$ by entering the formula for the kinetic energy into the Definition window.
The "*" is used for multiplication and the "^" for exponentiation.
You will be able to define m1, v1, m2, and v2 after you type in the formula and click on "Accept". m1 and m2 are Constants whose values are given above.
v1 and v2 are Data Measurements which are the velocities of gliders 1 and 2 respectively.
Note that a calculated data set for the kinetic energy appears in the list at the left.
Display the total kinetic energy on a separate graph and print the graph.
c) Is the collision an elastic or inelastic collision?
d) Is kinetic energy conserved during the collision to within experimental error?
e) Make an editable copy of the kinetic energy data. (Hint: Making a table of the data and using the "pencil" icon are involved).
Edit the data and remove the biggest spike in the kinetic energy data.
(Doing this in the lab would be a falsification of the data and would result in severe penalties.) Print a graph of the "smoothed" kinetic energy data.

2) Have your picture taken in the Engineering Science office. Do this immediately since there may be a lineup when this assignment is due.

(OVER)

3) You are responsible for learning error analysis for use in the laboratory on your own. All the information that you need, (and there is a lot of it), is on the web site:

http://www.upscale.utoronto.ca/PVB/Harrison/ErrorAnalysis/

Study this information and answer this question which was actually generated by ERRTST.

You are measuring the time for a metal bob to fall a fixed distance using the free fall apparatus.
You have repeated your measurement 36 times and the calculated average for the time is 0.056601 s.
You calculated the standard deviation of each measurement to be 0.07 ms, which is larger than the reading error of 0.05 ms.
The accuracy of the timer is 0.2 ms.
What is the error, in ms, in the **average value** of the time (no units please)?

4) A particle whose equation of motion is given by $\frac{d^2x}{dt^2} = -Qx + R$ has a speed which is zero and is at the point (5,0) when $t = 0$. The next time that it is at the point (5,0) it has traveled a distance 12.0 meters and the time is $t = \pi$ seconds.
   a) Write down, or derive, the solution to this equation which gives x as a function of t.
      If you just write down the answer then you must explain how you determined the constants in your answer.
      When you are finished, there should be no variables other than x and t in your answer.
   b) Determine the value of Q.
   c) Determine the value of R.

5) Serway and Jewett, Chapter 15, number 14.

If you wish to be called by a name which is different from the one that appears on ROSI then please email me (john.pitre@utoronto.ca) so that I can change the class lists (I won't change ROSI).
Examples:

My name appears as:	**I wish to be addressed as:**
Robert	**Bob**
Nicollette	**Nicole**
Jun Min	**Frank**
Charles Chin Kei	**Chin Kei**