

Name: _____

Investigating Spring Forces

Brief Introduction

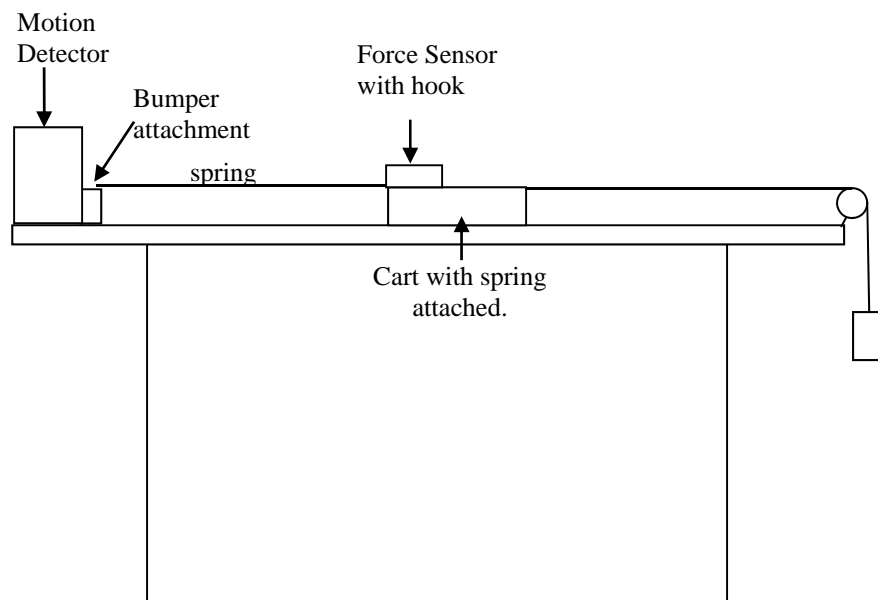
Springs are important to understand, because springs can be used to model a wide variety of interactions. It is common to model solids as balls attached by springs. In this lab you will be looking for an equation that governs the forces exerted by springs. You will be using force sensors, as well as motion detectors to collect data.

Equipment:

3 IDS Harmonics Springs,
Force probes,
Motion detectors,
Carts and tracks with Bumper attached.
Mass and Hanger Set
Super Pulley

Data Collection-Part One:

Turn on the computer and create a file that includes graphs of force and displacement. Connect the Motion Detector and the Force Sensor to the PowerLink. Plug the PowerLink into the USB port on the computer. Be certain the switch on top of the Motion Detector is set to the cart (this decreases the distance the Motion Detector can 'see' but increases the accuracy within a small region of space.) The force probe should be set-up so that a push is positive. Before connecting the force probe, you should first hit the zero button.



In the first part of this lab you will be looking for an equation that governs the spring force. You will do this by hanging masses over the pulley. You should start by hanging the 10 g mass and measuring the position of the cart, this will be your baseline. You will use a combination of the hanging masses to stretch the spring further, each time measuring the force and the displacement of the cart. You will need at least 10 measurements of force and displacement, which you can record in the chart below.

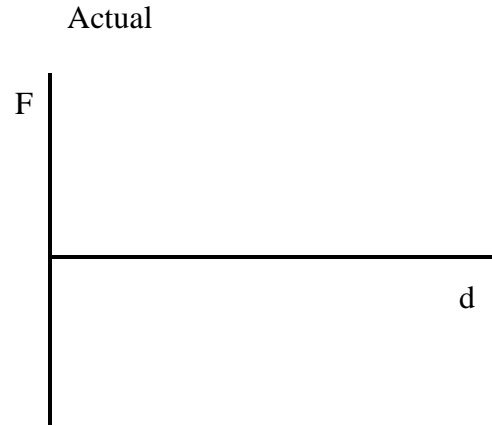
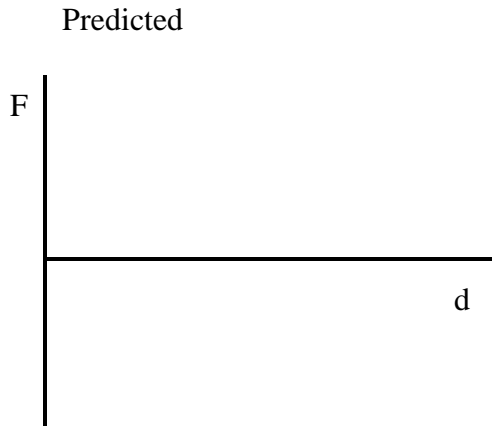
Trial	Mass	Force	Displacement
1	10g		
2			
3			
4			
5			
6			
7			
8			
9			
10			

In order to determine the equation for the spring force, you will need to plot Force vs. Displacement and fit a line to your graph. You should print your graph, with the equation displayed and the line of best fit and include it with your lab package.

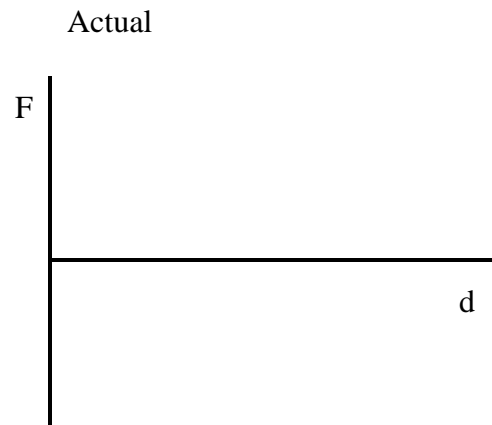
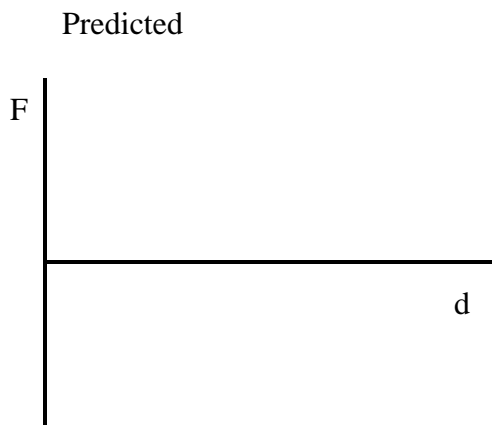
Equation for F_{spring} _____

In this second part, you will be collecting data on a number of different spring configurations. You will be using a similar experimental setup to part one, but instead of hanging masses, you will be pulling with your hand. This will allow you to apply constantly increasing force as you stretch the spring. You will be collecting data on three different configurations.

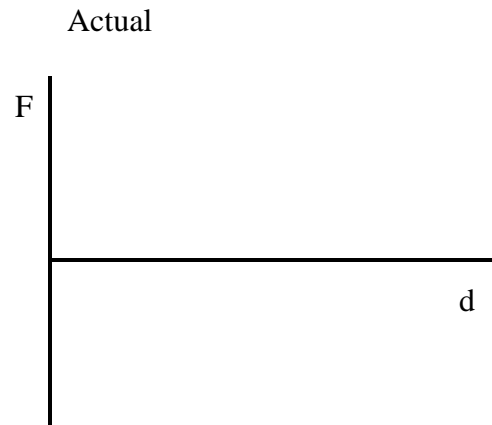
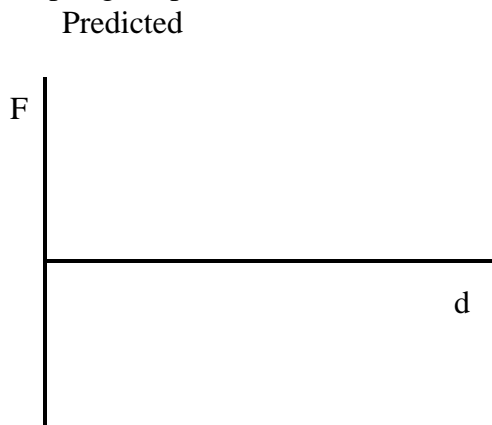
One spring



Two Springs connected end to end



Two Springs in parallel



Interpreting F vs. d graphs

1. What does the slope of the F vs d graph tell you?
2. What does the area under the F vs. d graph tell you?
3. Compare the F vs. d graph for one spring, to the F vs. d graph for two springs connected in parallel.
4. Compare the F vs. d graph for two springs in parallel to the F vs. d graph for two springs connected end-to-end.