Purpose
To verify Hooke's law and calculate the spring constant.

Theory

The force due to a spring stretched (or compressed) a distance Δx from the equilibrium position is given by the followi

$$\vec{F}_s = -k\Delta\vec{x}$$

where s = (force exerted by) spring
k = the spring constant (in N/m)

Procedure

Procedure Equipment

The necessary equipment for this lab is as follow:

Meter Stick
Spring
Weights
Clamp
Rods
Suspension Clamp

Position Measurements

The equipment is to be set up as shown below:

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Hang a weight from the end of the spring. For the lng spring use weights ranging from 0.5 kg to 2 kg and for the short spri
Measure the distance (Δx) the spring is stretched from its equilibrium position ($x = 0$).
Repeat the above measurement for at least 7 more weights.

Data

Configuration of Mass	Data Collected Mass in kg	x_i in meters	x_f in meters
#1	1.036	0.782	0.784
#2	2.033	0.782	0.803
#3	4.033	0.782	0.876
#4	6.032	0.782	0.951
#5	1.528	0.782	0.786
#6	3.527	0.782	0.860
#7	5.526	0.782	0.933
#8	2.530	0.782	0.822

Analysis

For each weight, calculate the force ($F = mg, g = 9.8\frac{m}{s^2}$) exerted on the spring by the Earth's gravitational force.

Force Calculated for each Configuration of Mass &Δx

Configuration of Mass	Experimental F in Nm	Δx in meters
#1	10.153	0.002
#2	19.923	0.021
#3	39.523	0.094
#4	59.114	0.169
#5	14.974	0.004
#6	34.565	0.078
#7	54.155	0.151
#8	24.794	0.040

Plot the force F versus the distance the spring is stretched (Δx). Based on Hooke's law your graph should follow a straight

Draw a best-fit line between the points and calculate the slope of the line. The slope of the line will correspond to the sprin

[h!]

Using this graph, the spring constant $k = 276.5$

Compare your experimental value(s) of k with the actual value(s) of k for your spring. (Long Spring k = 23 N/m & Short S

Do your results agree with Hooke's law (i.e. is F directly proportional to x)?

Error Analysis and Procedural Errors

Conclusion

Suggestions for Improvement