Lab 5.2

Hooke's Law

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Problem: To prove that the amount of deformation of an elastic object is proportional to the forces applied to deform it.

Hypothesis: A constant will always be present and equal for any mass or force that is applied to that particular spring or elastic band

Apparatus: 3 different springs or elastic band
Various Masses
Meter Sticks
Retort Stand
Test tube clamp

Procedure:
1. The spring was attached to a clamp. The height of the spring was adjusted so that the lower end of the spring is level with the zero mark on a metre stick.
2. A data table was set up in the notebook.
3. A small mass (20g) was added to the spring. The extension from the zero point was measured and the results were recorded in the data table. The size and number of masses added will depend on the rigidity of the spring.
4. Step 3 was repeated using masses of 40g, 60g, 80g and 100g.
5. Steps 3 and 4 were repeated using the other 2 springs or elastic bands.
6. The spring constant was calculated by dividing the force by the extension.

Observation:

Table 1: Data Table for First Spring

Attached Mass (g)	Force (N)	Extension (m)	Constant (k)
0	0	0	0
0.20	1.96	0.097	20.2
0.40	3.92	0.202	19.4
0.60	5.88	0.288	20.4
0.80	7.84	0.381	20.6
1.00	9.8	0.513	19.1

Diagram 1: Force vs. Extensions for First Spring

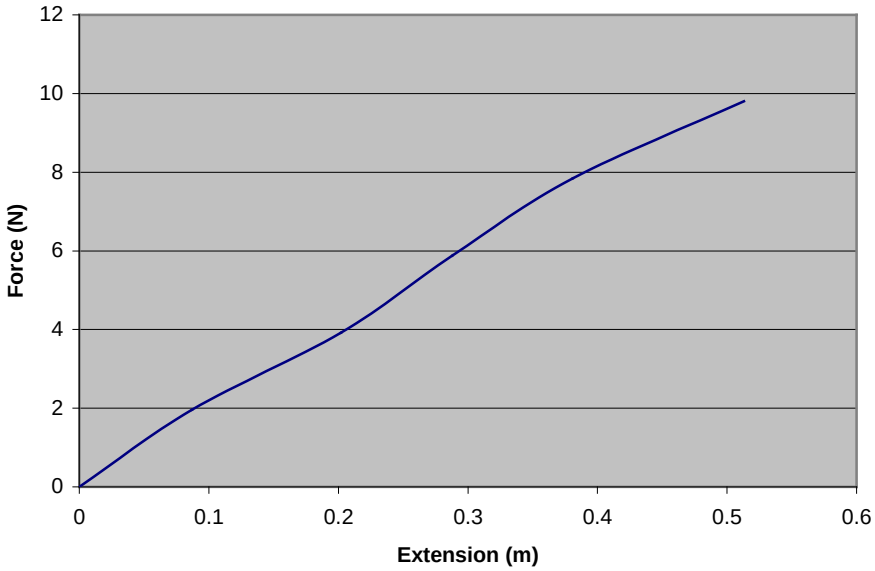


Table 2: Data Table for Second Spring

Attached Mass (g)	Force (N)	Extension (m)	Constant (k)
0	0	0	0
0.20	1.96	0.025	78.4
0.40	3.92	0.052	75.4
0.60	5.88	0.079	74.4
0.80	7.84	0.102	76.8
1.00	9.8	0.129	75.9

Diagram 2: Force vs. Extensions for Second Spring

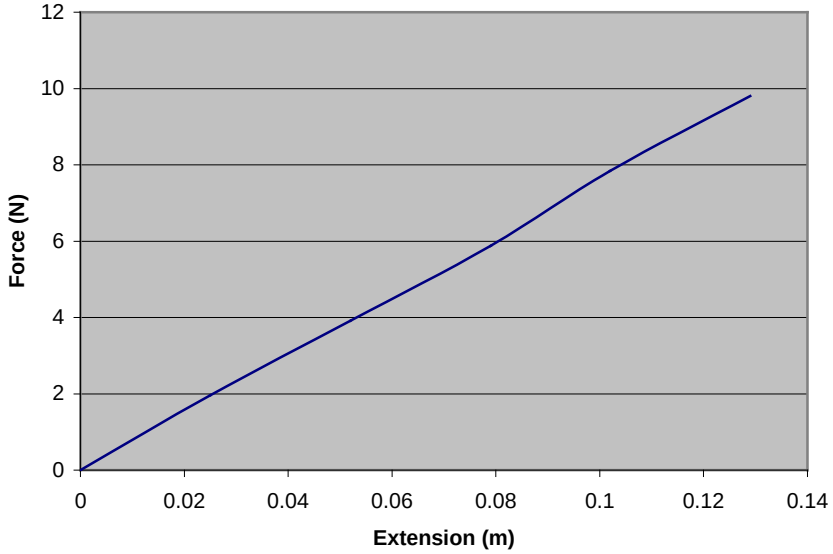
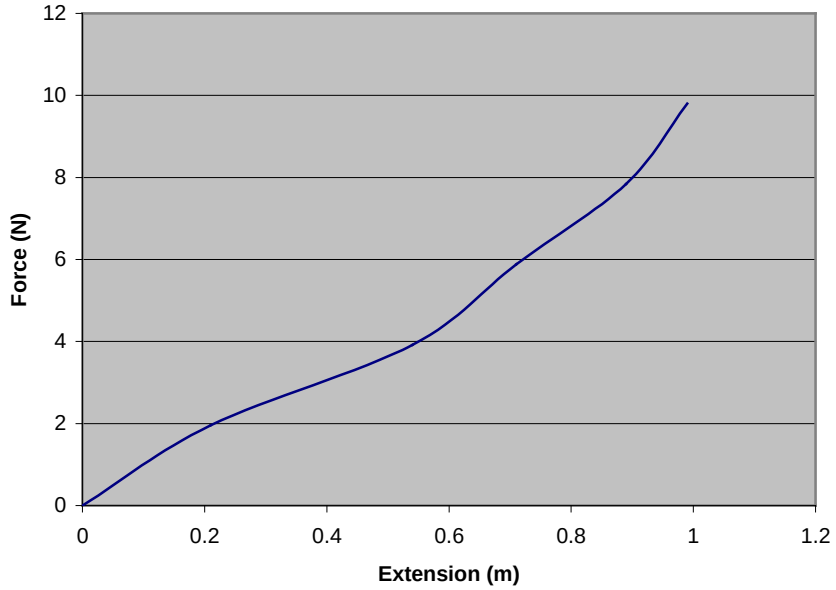


Table 3: Data Table for Third Spring

Attached Mass (g)	Force (N)	Extension (m)	Constant (k)
0	0	0	0
0.20	1.96	0.21	9.2
0.40	3.92	0.54	7.3
0.60	5.88	0.71	8.3
0.80	7.84	0.89	8.8
1.00	9.8	0.99	9.9

Diagram 3: Force vs. Extensions for Third Spring



Conclusion:

The results in our experiment prove that the amount of deformation of an elastic object is proportional to the forces applied to deform it. In order for the spring to store energy, the spring stretches and becomes deformed by a force (force of gravity on the mass). The spring then transfers its stored energy by returning to its normal state. However if the force applied is too great, the spring can be deformed permanently or break. The amount of deformation can be determined by measuring the length of the spring's stretch (extension). The spring constant (k) of the spring is the slope of the straight line on the Force vs. Extension graph. The constant is approximately equal for any mass or force that is applied to that particular spring. For the first spring, the constant is approximately 20 N/m, for the second spring it is approximately 76 N/m, and for the third spring it is approximately 9 N/m. The spring constant measures the stiffness of the spring and the larger the value for the spring constant means the stiffer the spring.