

Spring Force Activity

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1 Setup

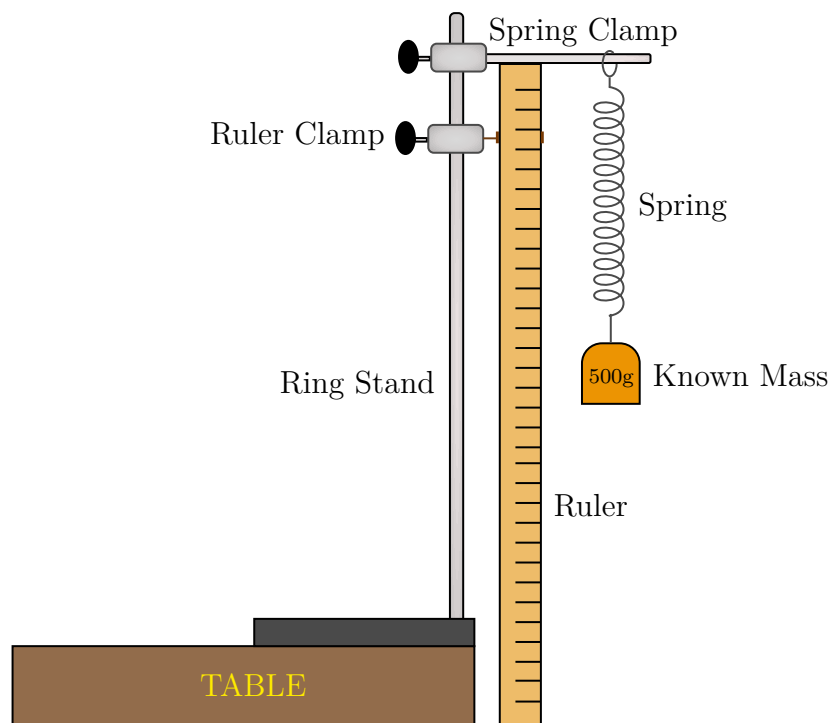


Figure 1: Setup Diagram

2 Observations

Table 1: Force and Displacement Data for Two Springs

| Mass (kg) | Force (N) | Spring A Displacement (cm) | Spring B Displacement (cm) |
|-----------|-----------|-------------------------------|-------------------------------|
| 0.20 | 1.96 | 2.20 | 0.270 |
| 0.40 | 3.92 | 10.3 | 0.450 |
| 0.60 | 5.67 | 19.1 | 0.920 |
| 0.80 | 7.85 | 28.1 | 1.43 |
| 1.0 | 9.81 | 37.6 | 1.91 |
| 1.2 | 11.8 | 45.1 | 2.40 |

3 Analysis

Figure 2: Force Vs. Displacement for Spring A

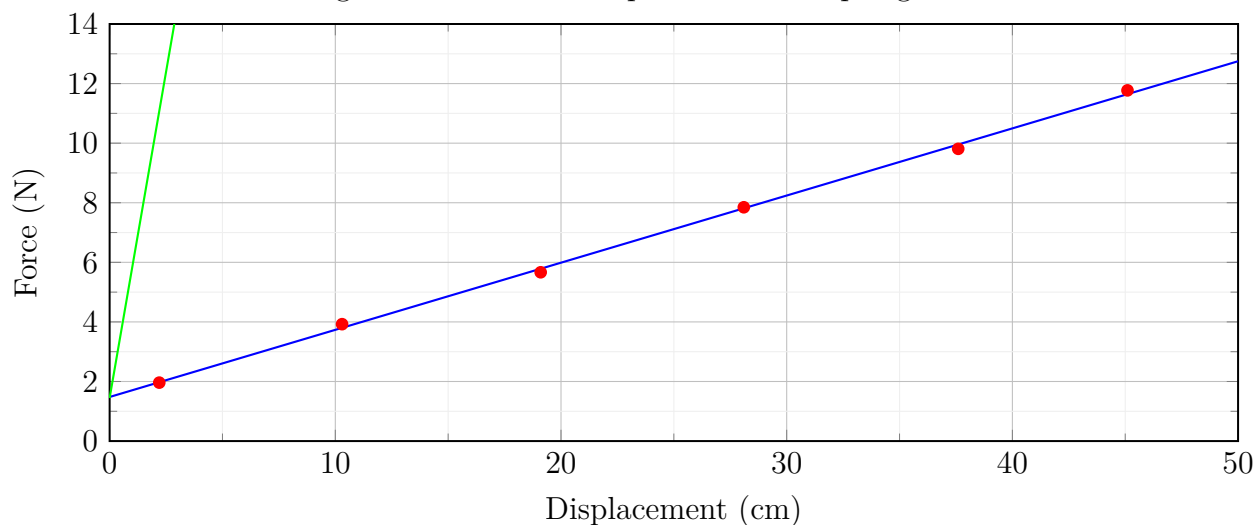
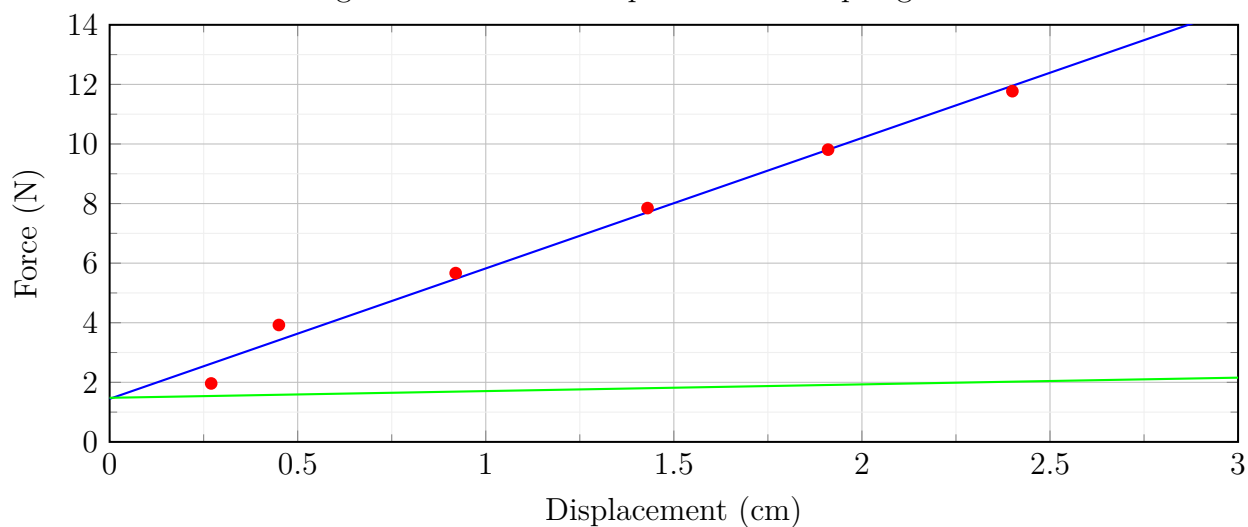


Figure 3: Force Vs. Displacement for Spring B



1. Calculating Slope of Each Graph:

(a) Spring A

The trendline's equation for Spring A is: $y = 0.225x + 1.48$

\therefore The slope of trendline is 0.225.

(b) Spring B

The trendline's equation for Spring B is: $y = 4.38x + 1.44$

\therefore The slope of trendline is 4.38.

2. Relationship Between Force and Displacement:

There is a linear relationship between force and displacement, where force is directly proportional to displacement ($\vec{F} \propto \vec{\Delta}d$).

3. Physical Quantity the Slope Represents:

The physical quantity the slope represents is the spring constant, which determines the stiffness of the spring. The two springs have different values because each spring has a different spring constant, where a higher slope value represents a stiffer spring. This holds true because Spring B has a larger slope than Spring A, meaning it is more stiff, evident through Spring B's smaller displacement values.

4. Equation of Line from Proportionality Statement:

Let k represent the slope of the line.

$$\vec{F} = k\vec{\Delta}d$$

5. Properties of an "Ideal Spring":