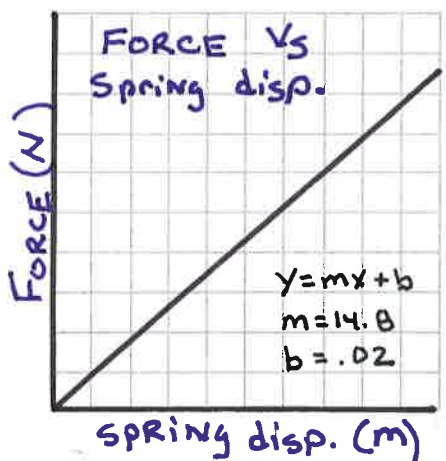


More Graphing Practice with Linearization

For each set of graphs below, add the proper axes labels and titles to the graphs and determine the written relationship between the variables and mathematical expression.

Problem 1

In a lab, students vary the displacement in a spring (m) and measure the resulting force (N). Add labels and titles to the first graph.



What modification is required to make the graph linear? NONE

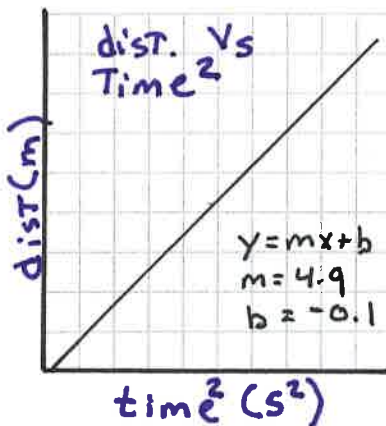
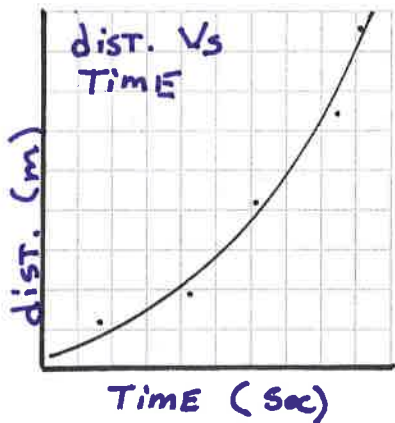
What is the written relationship between spring displacement and force?

FORCE is directly Proportional to Spring displacement.
What is the mathematical relationship (equation) between spring displacement and force?

$$\text{FORCE} = 14.8 \frac{\text{N}}{\text{m}} \cdot (\text{displacement})$$

Problem 2

In a lab, students roll a ball down a ramp and measure the distance (m) that it has traveled every second. Add labels and titles to the first graph.



Calculate the units For the slope

$$\frac{\Delta d}{\Delta t^2} = \frac{\text{m}}{\text{s}^2}$$

What modification was required to make the graph linear? Square Time

What is the written relationship between distance and time?

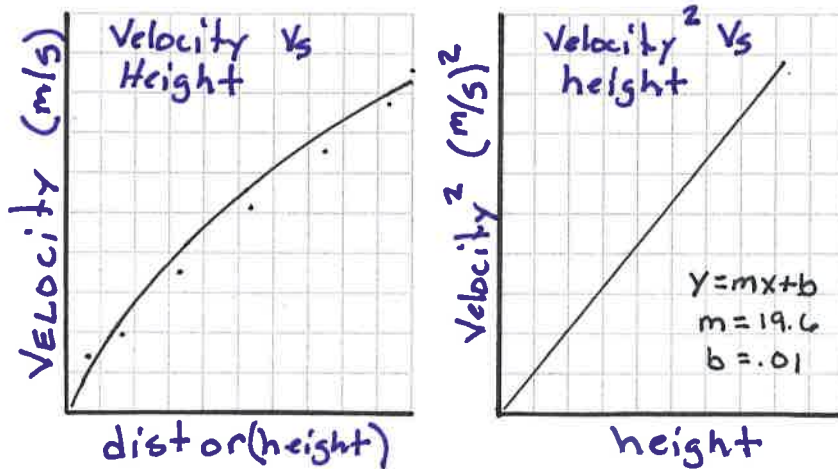
DISTANCE is proportional to time SQUARED

What is the mathematical relationship (equation) between distance and time?

$$\text{distance} = (4.9 \text{ m/s}^2) \cdot \text{time}$$

Problem 3

In a lab, students vary the height (m) from which a ball falls and measure the resulting velocity as it hits the ground (m/s). Add labels and titles to the first graph.



Calculate the units
For the slope

$$\frac{\Delta V^2}{\Delta h} = \frac{(m/s)^2}{m} = m/s^2$$

What modification was required to make the graph linear? Square Velocity

What is the written relationship between height and velocity?

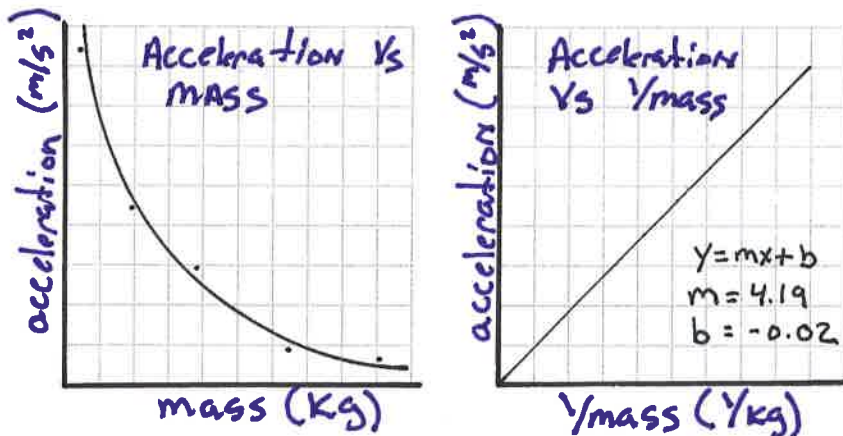
Velocity Squared is Proportional to height dropped

What is the mathematical relationship (equation) between height and velocity?

$$V^2 = 19.6 h$$

Problem 4

In a lab, students vary the mass of a cart (kg) with a constant force applied, the measure the subsequent acceleration (m/s²). Add labels and titles to the first graph.



Calculate the units
For the slope

$$\frac{\Delta A}{\Delta 1/m} = \frac{m/s^2}{1/kg} = kg m/s^2$$

What modification was required to make the graph linear? plot a vs 1/mass

What is the written relationship between mass of the cart and acceleration?

acceleration is INVERsly Proportional to mass

What is the mathematical relationship (equation) mass of the cart and acceleration?

$$a = 4.19 \text{ kg m/s}^2 \left(\frac{1}{m} \right) = \frac{4.19 \text{ kg m/s}}{\text{mass}}$$