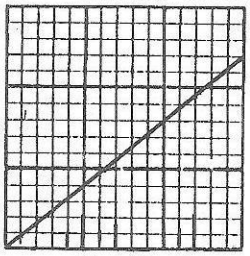
Honors Physics Mr. McMullen

Name _____ Date _____ Period_____

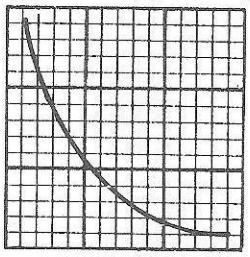
# Interpreting Graphs

In the laboratory investigations, you generally control one variable and measure the effect it has on another variable while you hold all other factors constant. For example, you might vary the force on a cart and measure its acceleration while you keep the mass of the cart constant. After the data is collected, you then make a graph of acceleration versus force using the techniques for good graphing. The graph gives you a better understanding of the relationship between the two variables.

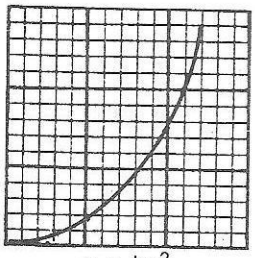
There are three relationships that occur frequently in physical processes. If the dependent variable varies directly with the independent variable, the graph will be a straight line passing through the origin (Figure 1(a) ). If $y$ varies inversely with $x$, the graph will be a hyperbola as shown in Figure 1(b). The third relationship, in which $y$ varies directly with the square of $x$, gives a parabola (Figure 1(c) ).



$y = kx$



$y = k/x$



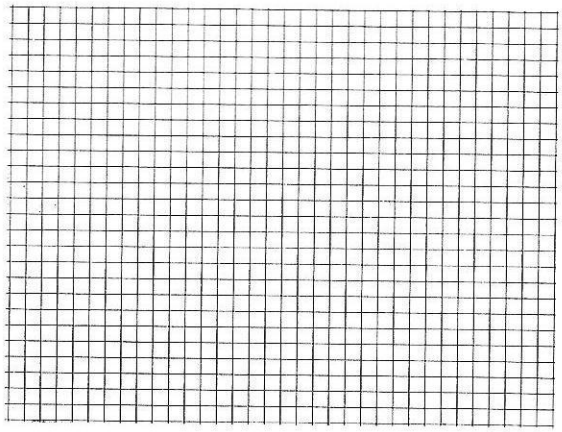
$y = kx^2$

Sometimes you need information about a value that you have not determined experimentally. Reading from the graph between data points is called *interpolation*. Reading from the graph beyond the limits of your experimentally determined data points is called *extrapolation*. Extrapolation must be used with caution because you cannot be sure that the relationship between the variable remains the same beyond the limits of your investigation.

## Problems

1. Suppose you recorded the following data below during your study of the relationship of force to acceleration. Plot the graph in the space provided.

| Force (N) | Acceleration ($m/s^2$) |
|---|---|
| 10 | 6.0 |
| 20 | 12.5 |
| 30 | 19.0 |
| 40 | 25.0 |



a. Describe the relationship between force and acceleration as shown by the graph.

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b. Write an equation for the line. (Recall that slope $= \frac{\Delta y}{\Delta x}$.)

c. What is the slope of the graph? Remember to include units with your slope. (A newton equals $kg \cdot m/s^2$.)

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