GUIDELINES FOR HAND DRAWN GRAPHS

☞ Each axis is always labeled with a variable name and unit (in parentheses).

• The independent variable is often placed on the horizontal axis (but this is not a requirement).

• The dependent variable is often placed on the vertical axis (but this is not a requirement).

☞ Use a ruler or straight edge on all straight lines. Neatness counts.

☞ The scale on each axis starts from zero and increases uniformly.

• The maximum scale values should accommodate the last data point, but should not be so large that the area containing the data points is too small. A good graph comes as close as possible to filling an entire sheet of graph paper with useful space. Thus, the rectangular area containing the data points must be greater than half the height and half the width of an entire sheet of graph paper.

• Scale values are centered under the grid-line they represent. Only indicate the prominent values (for example: 10, 20, 30, …) and highlight the grid-line with a "tick" mark. Do not label every value on an axis.

• Choose intervals that are simple to divide. This makes it easier to locate and identify the points in-between. (This is called interpolation.) For example…
  - 5 grid-lines = 10 units
    (each interval is 2 units)
  - 20 grid-lines = 1 unit
    (each interval is 0.05 units)

  but not…
  - 7 grid-lines = 15 units
    (each interval is 2.142857… units!)

• The scales need not be identical to one another. In fact, this rarely ever happens.

☞ Graphs can be used as a means to record results in a compact and easy to analyze form. Some graphs are simply a record of events, but in physics class they are usually drawn to determine the relation between to two variables. Thus, data points are never connected zigzag style by a series of line segments. Instead, the mathematical curve that best fits the data is drawn through the points (straight line, parabola, hyperbola, …).

• The best fit curve comes as close as possible to the data but is not required to intercept any of the data points or the origin. Some points may lie directly on the curve, but usually not all of them. If a curve has been properly fit, about half the data points not on the curve will lie on either side in a random fashion. Any points far off the trend are usually disregarded when choosing a curve.

☞ When a graph has a best fit curve that is a straight line, the two quantities are said to be directly proportional (or linearly dependent). The slope of the line is the constant of proportionality that should be calculated and often has a physical interpretation.

• Calculate the slope of the best-fit line from two points on extreme ends of the line itself. Choose points which cross an intersection of grid-lines on the graph paper. Identify them on your graph in some way so that I can find them. Never use values taken from the data table to calculate slope. Never!

• Recall:

$$slope = \frac{rise}{run} = \frac{vertical\ \ change}{horizontal\ \ change} = \frac{\Delta y}{\Delta x}$$

• Use the coordinate values of your points in the slope formula. Write the calculations in the empty spaces on the graph. Place a box or other identifier around the results. Don't forget to follow the rules of significant digits (three are normally enough) and to include a unit.

☞ Data points for different trials are plotted using different colors or a different marker (*e.g.*, dot, cross, circle…). Multiple lines on a graph are labeled.

☞ Place a descriptive title on the graph.
For example…
  - The effect of mass on the period of a simple pendulum.

  But not…
  - Mass vs. Period