AISD Physics Graphing Rules

Graphs give instant ability to see trends and relationships between variables.

The variable that is manipulated is the *independent* variable. The variable that *changes* as a result of the independent variable is called the *dependent* variable.

Obtaining information from locations *between* data points is called *interpolation*. Predicting information from locations *outside* your data points is called *extrapolation* and should be considered carefully for reliability.

The shape plotted is generally referred to as a **curve**, no matter its shape.

When plotting a graph, you should:

1. Use **graph paper and a pencil**.

2. Identify which variable goes on which axis. **If the format is specified in order, as, for example,** *distance vs. time***, plot** *distance* **on the Y-axis and** *time* **on the X-axis.** Otherwise, plot such that the slope, area, and/or y-intercept provide meaningful information or place the independent variable on the X-axis as appropriate.

3. Include a **title** for your graph that includes the purpose of the graph, most likely in terms of its variables. "Motion Lab Graph" is not sufficient, however "Distance vs. Time for Cart" would be acceptable because "Distance" would be the vertical axis title and the "Time" would be the horizontal axis title.

4. Your graph should occupy at least 2/3 of a page.

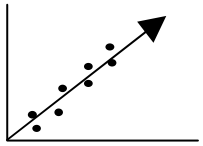
5. Choose a scale such that a **minimum** of 2/3 of the graph is used to form the curve. Use practical divisions for your scale, usually multiples of 1, 2, 4, or 5.

6. Do not break the axis unless instructed to do so. (No *squiggles* )

7. Label each axis with the **name of the variable and its unit**. Use a **straight edge** to draw in your axes.

8. Not all curves go through the origin. You must consider your experiment and decide if (0,0) is valid for your data. For example, if a cart is at rest when you start the timer, then its speed is zero, and your graph of speed vs. time could include a point at the origin. If the cart is already in motion when the timer is started, there is no (0,0) point.

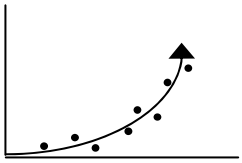
9. If the data points appear to lie roughly in a straight line (or you **know** they should make a straight line), draw the **best-fit line** with a **ruler**. Draw the line through as many points as possible, so that there are as many points above the line as below the line.



Best Fit Line

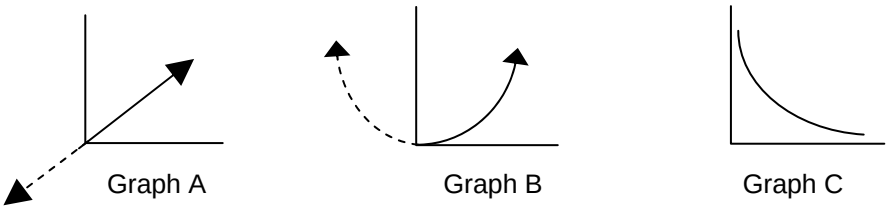
10. Do not simply draw a line between (0,0) and the last data point!
Do not draw dot-to-dot!

11. If the data points are not linear, consider trends or curves (parabola, hyperbola, etc). Then draw the appropriate **smooth curve** that goes through as many data points as possible. Adjust your curve such that there are as many missed points above the curve as below it.



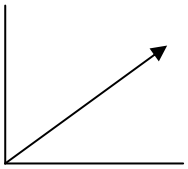
Best Fit Curve

12. Three possible trends occur frequently. **Direct** variation ($y \propto x$) generates a **line** (Graph A). Variation as the **square** ($y \propto x^2$) generates a **parabola** (Graph B). **Inverse** variation ($y \propto 1/x$) gives a **curve that approaches its limits on the x and y axes** (Graph C).

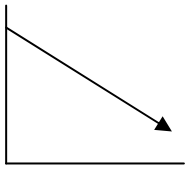


Graph A Graph B Graph C

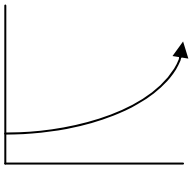
13. Describing curves: We can't always know if a graph is a true parabola or hyperbola, but we can describe the general shape. Describe with the language under the graph.



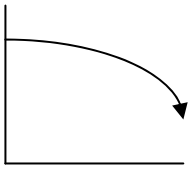
Y increases linearly with X.



Y decreases linearly with X.



Y increases non-linearly with X.



Y decreases non-linearly with X

14. If a data point is outside of the general trend, you may omit it. Circle it, think back to your data collection or process, and explain what happened.