Honors Physics Mr. McMullen

Name _____ Date_____ Period _____

Graphical Analysis of Motion

Graphical analysis of motion helps you picture the relationships among position, velocity, and acceleration. If you have a graph of any one of the three variables with respect to time, you can find the other two by determining the area under the curve or the slope of the curve. As you work with the graphs, keep in mind what each axis represents. To derive a position-time graph from a velocity-time graph, graph the time versus the area under the curve at that time. If you label your axes carefully, dimensional analysis will tell you whether you have used the correct relationship. The units of the slope, $(\frac{\triangle y}{\triangle x})$, will be the y-axis units divided by the x-axis units. If your graph is velocity (m/s) versus time (s), the slope will be $\frac{m/s}{s} = m/s^2$, which is acceleration. When you find the area, multiply the units of the y-axis by the units of the x-axis. When you multiply velocity (m/s) by time (s), you get m, which is position.

1. Identify the following.

_____ **a.** the slope of a position-time graph

_____ **b.** the slope of a velocity-time graph

_____ **c.** the area under an acceleration-time graph

_____ **d.** the area under a velocity-time graph

2. A motorboat travels straight down a river at 40.0 m/s.

a. Construct a table showing the total position of the boat at the end of each second for 10.0 seconds.

b. Use the data from the table to plot a position-time graph.

c. Show that the slope of the line is equal to the velocity.

d. Plot a velocity-time graph of the boat's motion for the first 10 seconds.

e. Find the displacement between the 5th and 10th seconds.

time	position