

# Match This Motion Lab Report

## *Physics*

This report is an individual assignment. You may neatly hand-write or type it. It should reflect your own thinking and ideas. Points will be awarded for completion and accuracy.

### **Predictions (make sure to review with your instructor and classmates as you go!)**

1. Draw  $x$ -,  $v$ -, and  $a$ -vs- $t$  graphs for someone moving in the following manner:
  - a. From 0 – 1 seconds, standing still 2 feet away from the sensor
  - b. From 1 – 2 seconds, moving from 2 to 5 feet away from the sensor at a constant velocity
  - c. From 2 – 3 seconds, standing still
  - d. From 3 – 5 seconds, moving from 5 to 3 feet away from the sensor, increasing speed at a constant rate
2. Examine your graphs at 4 seconds. Answer the following questions in 1-2 sentences for each graph:
  - a. What the coordinates of each graph means at that time.
  - b. What the sign (+, -, or 0) of the slope of each graph tells you.
  - c. What the steepness of the slope of each graph tells you.
3. Estimate the **NET** area between the  $v$ -vs- $t$  graph line and the time axis from time 1-5. This should tell you the displacement during this time period. (We haven't discussed this yet but you can quickly verify this with a little research.)
4. Does the displacement you calculated in #3 match the actual displacement described in #1? If so, go on to the next section. If not, revise your predictions until they are accurate.

### **Tests and Observations (verify as you go!)**

Using the motion sensors, create the graphs described above in #1. (It may take you several trials to achieve this.)

5. Sketch the actual  $x$ -,  $v$ -, and  $a$ -vs- $t$  graphs you produced and compare them to your predicted graphs by answering the following questions:
  - a. How does the overall shape of each actual graph match your predictions? Explain, in 2-3 sentences, how and **why** any differences showed up, if applicable.
  - b. How do the coordinates, sign of the slope, and steepness of the slope appear at 4 seconds as compared to your predictions? Again, explain how and **why** your predictions were different from the actual graphs, if applicable.
6. Discuss how, in general,  $x$ -,  $v$ -, and  $a$ -vs- $t$  graphs are tied together mathematically. Give specific examples using the coordinates and slopes of the graphs you produced for this lab report.