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. Turn in through Showbie.

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

1. Draw an *x-vs-t* graph for someone moving in the following manner:
    a. From 0 – 2 seconds, standing still 1 meter away from the sensor
    b. From 2 – 4 seconds, moving from 1 to 2 meters away from the sensor at a constant velocity
    c. From 4 – 6 seconds, standing still
    d. From 6 – 10 seconds, moving from 2 to 1.5 meters away from the sensor, **increasing speed** at a constant rate
2. From your *x-vs-t* graph, construct a *v-vs-t* graph.
3. Examine your graphs at 3 seconds. Answer the following questions in 1-2 sentences for each graph. Be specific – use the actual numbers on your graphs, not just generalities.
    a. What do the coordinates of each graph means at that time?
    b. What does the sign (+, -, or 0) of the slope of each graph tell you?
    c. What does the steepness of the slope of each graph tell you? (This is qualitative.)
4. 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.
5. Does the displacement you calculated in #4 match the actual displacement from your graph in #1 (the displacement on an *x-vs-t* graph is the difference between the starting and ending location for a given time period)? 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. Adjust the data collection time if necessary. It may take you several trials to reproduce the graph successfully.

6. Sketch the actual *x*- and *v-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 3 seconds as compared to your predictions? Again, explain how and **why** your predictions were different from the actual graphs, if applicable.
7. Discuss how, in general, *x*- and *v-vs-t* graphs are tied together mathematically. Give specific examples using the coordinates and slopes of the graphs you produced for this lab report.