Group Member Names:

AP PHYSICS I

Lab: Understanding Motion

Purpose

The purpose of today's lab is to create a graphical understanding of the basic properties of motion. We will be looking as things such as slopes of graphs and verbally describing what certain aspects of a motion-time graph represent.

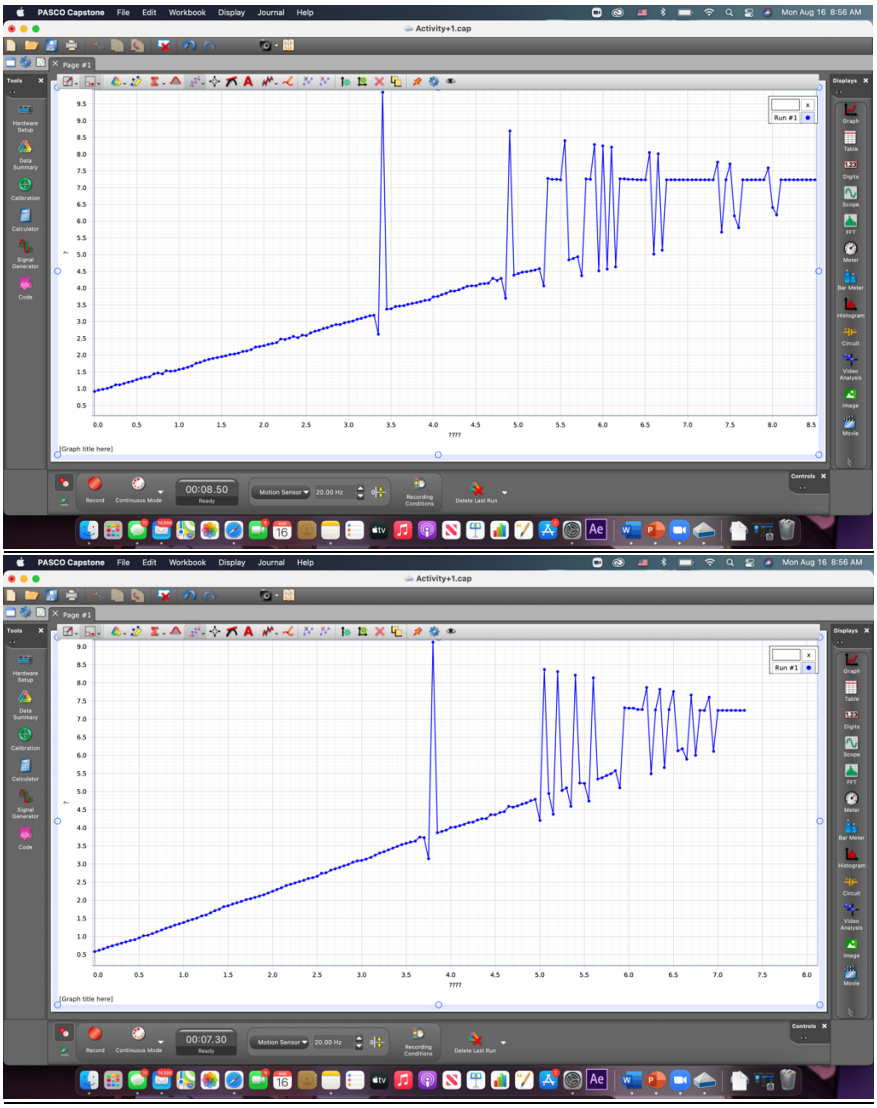
Procedure

Part 1 – Try Something and Cross your Fingers

Open "Activity 1"

- **Draw-1.1**: Stand with the board in front of you and face the motion sensor. Walk in a controlled, slow method and reproduce the graphs on the following axes. Try this a few times: Each member of your group should try it once.

Insert a Picture of this in the space below



- **Predict 1.2**: Do this one by yourself! What do you think the *y*-axis on the graph represents? The *x*-axis?

The y-axis represents position and the x-axis represents time.

- **Analysis 1.3**: If you were to pick single words to use as labels for each axis, what would they be? Why?

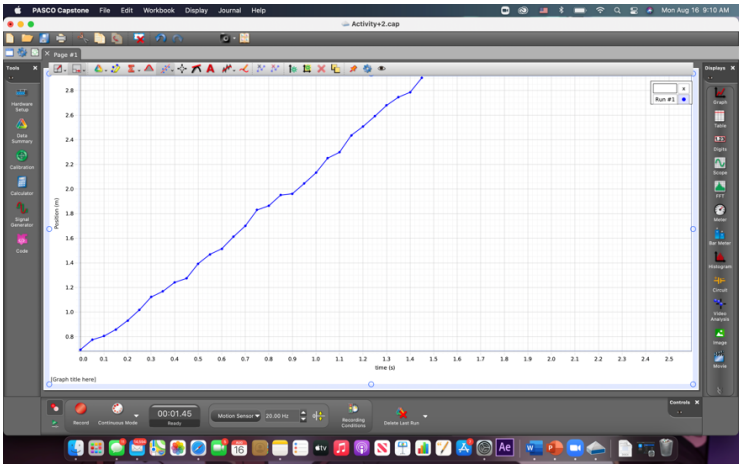
Position (meters) for the y-axis and time (seconds) for the x-axis.

Part 2 – Now Use My Words

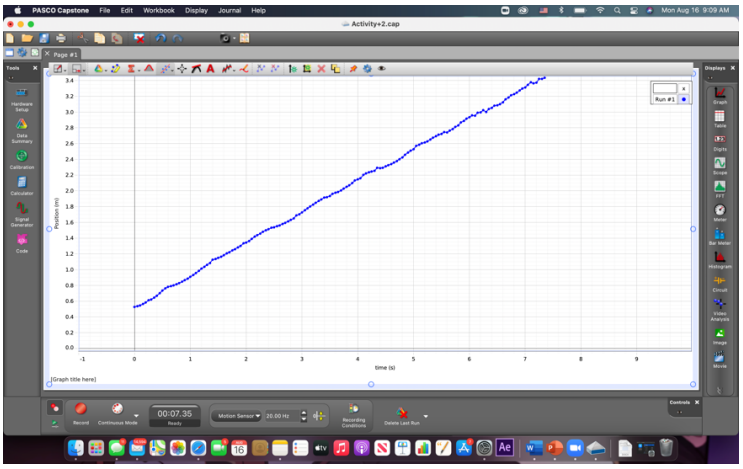
Close “Activity 1” and open “Activity 2”

- **Draw 1.4**: With this graph, record the movement of the following conditions and display them simultaneously. Your teacher can help you with this. Label each graph before taking a screenshot.

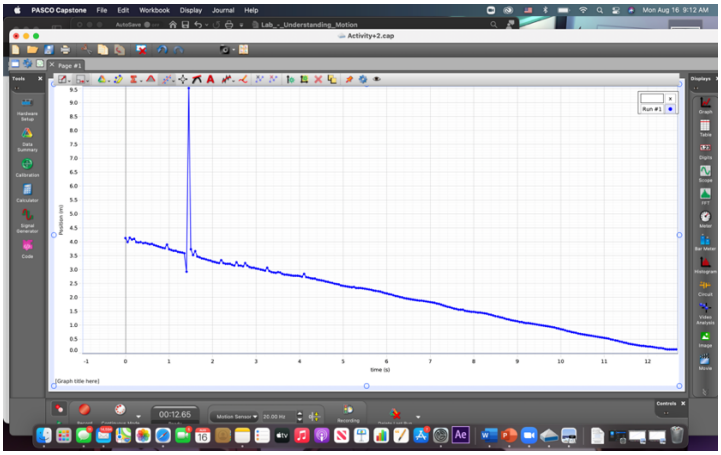
A steady, slow motion, away from the detector.



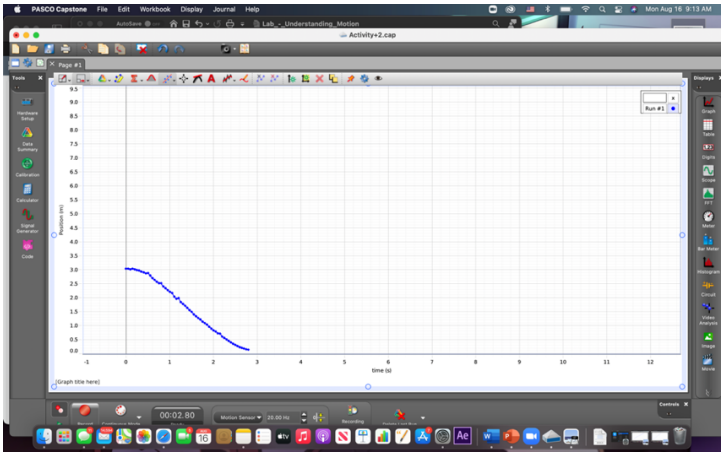
A steady, fast motion, away from the detector.



A steady, slow motion, toward the detector.



A steady, fast motion, toward the detector.



Insert a picture of this below.

- **Analysis 1.5**: Explain why you think the graphs will look like this.

A positive incline demonstrates the person getting farther away as time passes, while a negative incline demonstrates a person getting closer to the motion detector because the distance is declining.

- **Analysis 1.6**: What is the primary graphical difference between the faster and slower movements?

For slower speeds, the position changes at a slower pace. For faster speeds, the position increases more rapidly.

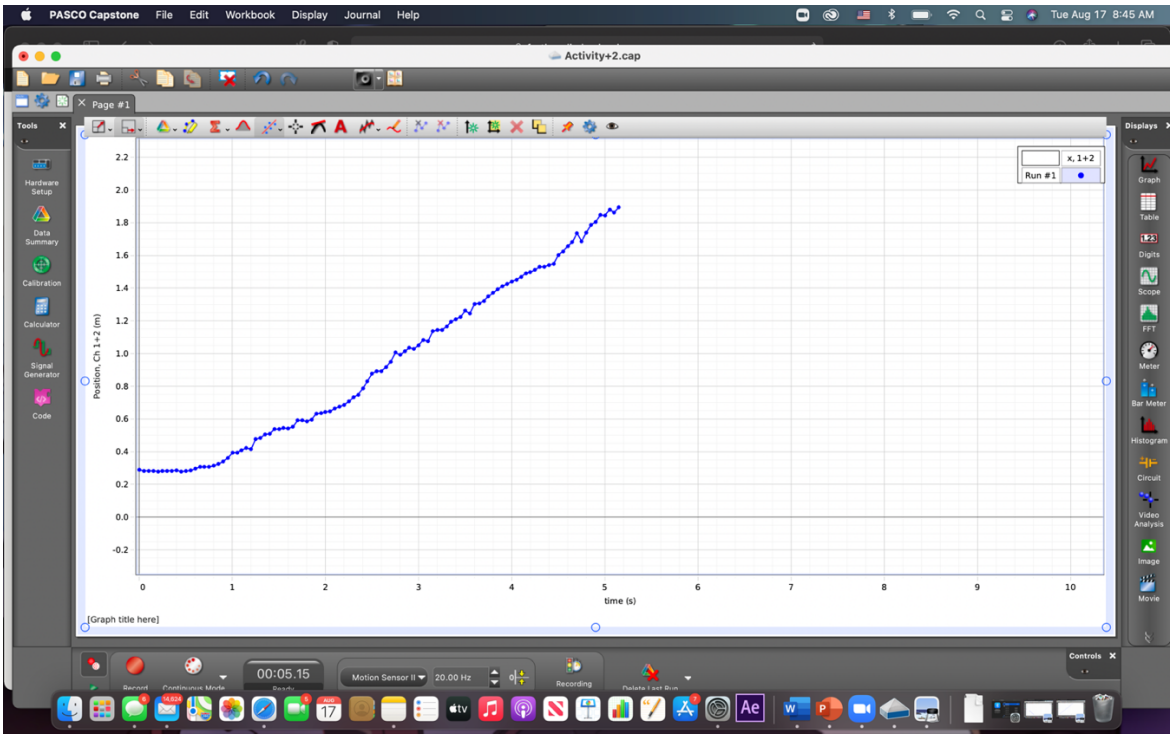
- **Analysis 1.7**: What is the primary graphical difference between the motions towards and away from the sensor?

For motion towards the sensor, the position decreases to 0, and for motion away from the sensor, the position increases infinitely.

Part 3 – Put it to the Test

Close “Activity 2” and open “Activity 3”

- **Draw 1.8**: Based on what you observed with the graphs so far, reproduce the graph with your own motion in front of the motion detector. Each lab group member should do this. Only include the graph that YOU were assigned in the blank below. Insert a screen shot of this.



- **Analysis 1.9**: Carefully describe the motion in the graph you just matched.

We walked away from the motion sensor at a steady pace. This is why the position is getting farther away in even time intervals.

Part 4 – A New Kind of Graph

Close "Activity 3" and open "Activity 4.1"

- **Draw 1.10**: A *different kind* of graph has just been opened. Each group member should make some motions in front of the detector. Make these motions calm and steady but do them at different speeds.

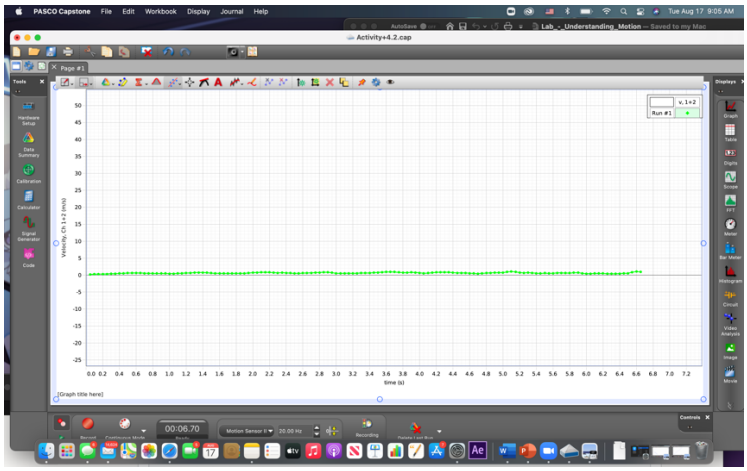
- **Analysis 1.11**: How would you describe what is being represented on the *x* and *y* axes of this graph? Check with your lab partners.

The x axis represents time (seconds) while the y axis represents velocity (m/s).

Close "Activity 4.1" and open "Activity 4.2"

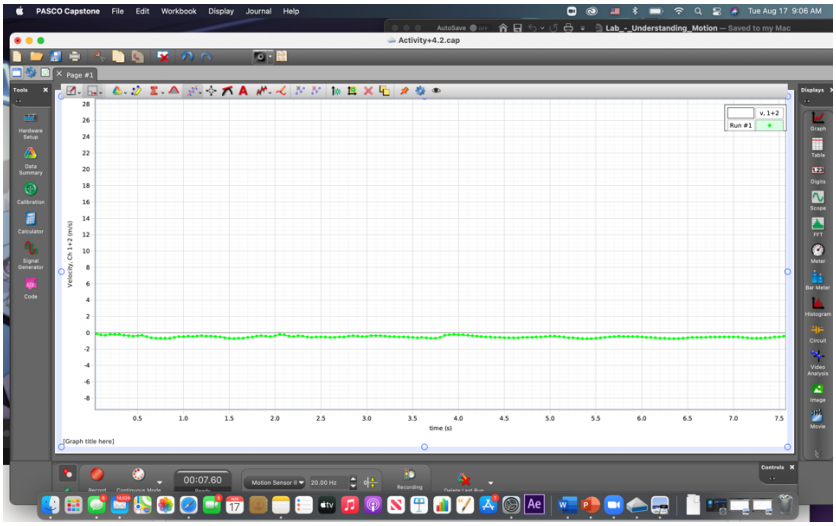
- **Draw 1.12**: With this new type of graph, recreate the following graphs and display them simultaneously. Label each graph before taking a screenshot.

A steady, slow motion, away from the detector.

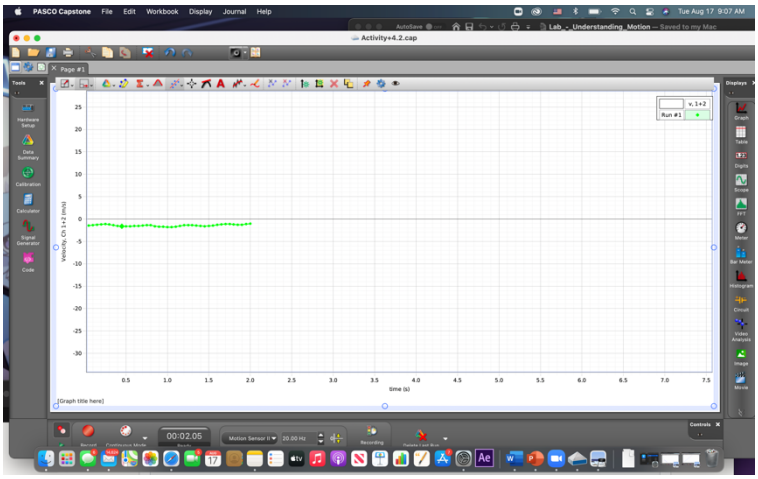


A steady, fast motion, away from the detector.

A steady, slow motion, toward the detector.



A steady, fast motion, toward the detector.



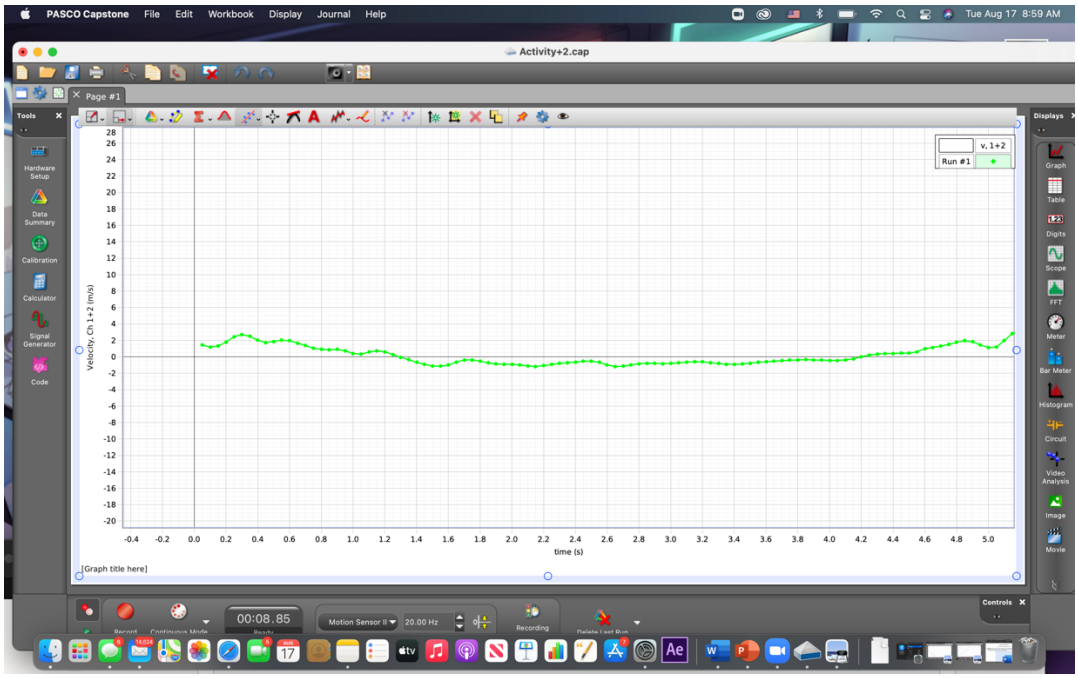
- **Analysis 1.13**: Briefly describe some differences and similarities between each graph

When walking away from the motion sensor at a constant pace, the line is straight and the velocity is positive. When walking towards the motion sensor, the velocity is negative because direction affects velocity. When walking at a slower pace and away from the detector, the velocity is less than walking at a faster pace. However, when walking towards the detector, the velocity is greater when walking at a slower pace. Slower motion also took more time compared to faster motion.

Part 5 – Put it to the Test

Close “Activity 4” and open “Activity 5”

- **Draw 1.14**: Based on what you observed with the graphs so far, reproduce the graph with your own motion in front of the motion detector. Each lab group member should do this. Only insert a screenshot of the graph that YOU were assigned in the blank graph below.



- **Analysis 1.15**: Carefully describe the motion you used to match the graph.

First, we walked away from the sensor at a fast pace, then we abruptly turned around and walked back towards the detector. Lastly, we changed directions and walked away from the sensor faster than before.