

MOTION GRAPHS

OBJECTIVES:

Students will predict graph shapes for various types of motion.

Students will relate the slope of a line to the rate of change of variables

Students will describe the relationships between distance, velocity, and acceleration as a function of time.

SCOPE:

Introductory level. This investigation will introduce students to the significance of graphs and the relationships described by graphs.

MATERIALS:

TI 83 or TI 83 Plus

CBL and Motion Detector or CBR

Adequate space for subject to move (3-4 meters)

HIKER and DTMATCH programs

PROCEDURE:

1. Check to make sure CBR/CBL program or application or Ranger program is loaded into calculator.
2. Run Hiker program.
 - A. TI83 Plus: APPS, CBLExpmt, ENTER, Hiker, ENTER
 - B. TI83 or TI83 Plus:PRGM, Hiker, ENTERStop when you see the message "PRESS ENTER TO START GRAPH".
3. Sketch the axes of a distance vs time graph.
4. Sketch the graph you would expect to see if the subject is standing still.
5. Position the subject in front of the motion detector. Make sure to move directly in front of the sensor and to keep within the range of 0.5 to 6.0 meters. Begin to move after you hear the sensor clicking. Press ENTER to begin graphing.
6. Sketch the actual graph displayed on the calculator next to your predicted graph.
7. Repeat steps 3-6 for each of the following movements:
 - walking slowly away from the sensor
 - walking faster away from the sensor
 - walking toward the sensor
 - walking away from and then towards the sensor
8. Design a graph for each student to try to match. Graph the student's actual movement and

sketch the graph. The part of your lab report will be different for each student.

9. Run DTMATCH (use the same pathway as for Hiker). Stop when you see the graph displayed.

10. Again make sure the student moves in line with the sensor and within the range of 0.5 to 6.0 meters. When the student is in position, press ENTER. This begins data collection. The student's movement is graphed real time. If the student carries the calculator, corrections can be made to better match the graph.

11. After the graph is complete, press ENTER. You will be given the choice of repeating the same graph, matching a different graph, or quitting the program. Repeat the graph match activity as time permits.

QUESTIONS:

1. What is the slope of the distance vs time graph of a person standing still?
2. How is a graph of a person walking toward the motion detector different from a graph of someone moving away from it?
3. What generalizations can you make about the direction of the slope of the line in a distance vs time graph?
4. What generalizations can you make about the steepness of the slope?
5. What is happening if the slope of the line changes?

MOTION GRAPHS EXPERIMENT
STUDENT REPORT SHEET

NAME:
HOUR:

1. Sketch of distance vs time graph for person standing still:

predicted

actual

2. Sketch of distance vs time graph for person moving slowly away from sensor:

predicted

actual

3. Sketch of distance vs time graph for person walking faster away from sensor:

predicted

actual

4. Sketch of distance vs time graph for person walking toward sensor:

predicted

actual

5. Sketch of distance vs time graph for person walking away from and then towards the sensor:

predicted

actual

6. Sketch of distance vs time graph designed for you by your group:

predicted

actual