Problem Set

Answers

1. Watch the video, "Elevation vs. Time #3" (below)

http://www.mrmeyer.com/graphingstories1/graphingstories3.mov. (This is the third video under "Download Options" at the site http://blog.mrmeyer.com/?p=213 called "Elevation vs. Time #3.")

It shows a man climbing down a ladder that is 10 feet high. At time 0 seconds, his shoes are at 10 feet above the floor, and at time 6 seconds, his shoes are at 3 feet. From time 6 seconds to the 8.5 second mark, he drinks some water on the step 3 feet off the ground. Afterward drinking the water, he takes 1.5 seconds to descend to the ground and then he walks into the kitchen. The video ends at the 15 second mark.

a. Draw your own graph for this graphing story. Use straight line segments in your graph to model the elevation of the man over different time intervals. Label your x-axis and y-axis appropriately and give a title for your graph. (The video shows a possible graph!)

b. Your picture is an example of a graph of a piecewise linear function. Each linear function is defined over an interval of time, represented on the horizontal axis. List those time intervals.

from 0 to 6; from 6 to 8.5; from 8.5 to 10; from 10 to 15.

c. In your graph in part (a), what does a horizontal line segment represent in the graphing story?

A horizontal line segment shows that the man is not going up or down

d. If you measured from the top of the man's head instead (he is 6.2 feet tall), how would your graph change?

The whole graph would be shifted up 6.2 feet.

e. Suppose the ladder is descending into the basement of the apartment. The top of the ladder is at ground level (0 feet) and the base at the ladder is 10 feet below ground level. How would your graph change in observing the man following the same motion descending the ladder?

The whole graph would be shifted down 10 ft.

f. What is his average rate of descent between time 0 seconds and time 6 seconds? What was his average rate of descent between time 8.5 seconds and time 10 seconds? Over which interval does he descend faster? Describe how your graph in part a can also be used to find the interval during which he is descending fastest.

$$\text{Average rate of descent} = \frac{\text{change in elevation}}{\text{change in time}}$$

from 0 to 6 seconds average rate $= \frac{10-3}{0-6} = -\frac{7}{6}$ ft/sec

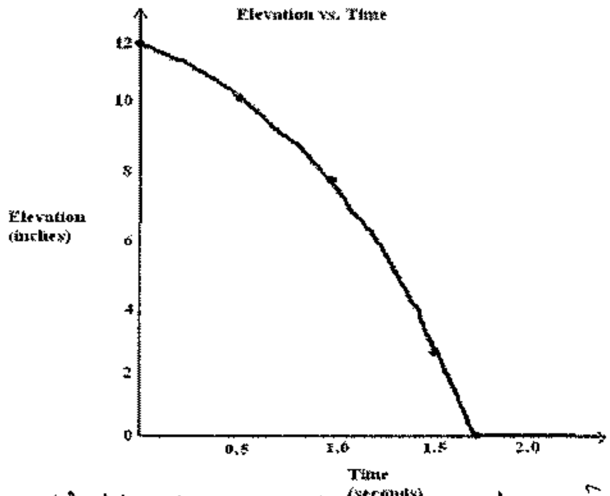
from 8.5 to 10 seconds average rate $= \frac{3-0}{8.5-10} = -2$ ft/sec

The steeper the line, the faster the rate.

He's going faster from 8.5 sec to 10 seconds

Problem Set

1. Here is an elevation versus time graph of a ball rolling down a ramp. The first section of the graph is slightly curved.



a) It wouldn't change the graph since elevation is 0 anyway

   a. From the time of about 1.7 seconds onwards, the graph is a flat horizontal line. If Ken puts his foot on the ball at time 2 seconds to stop the ball from rolling, how will this graph of elevation versus time change? It won't change.
   b. Estimate the number of inches of change in elevation of the ball from 0 seconds to 0.5 seconds. Also estimate the change in elevation of the ball between 1.0 seconds and 1.5 seconds. about 1.5 inches; about 5.5 inches
   c. At what point is the speed of the ball the fastest, near the top of the ramp at the beginning of its journey or near the bottom of the ramp? How does your answer to part (b) support what you say?

   The ball is fastest near the bottom of the ramp.

2. Watch the following graphing story:

   Elevation vs. Time #4 [http://www.mrmeyer.com/graphingstories1/graphingstories4.mov. This is the second video under "Download Options" at the site http://blog.mrmeyer.com/?p=213 called "Elevation vs. Time #4."]

   The video is of a man hopping up and down several times at three different heights (first, five medium-sized jumps immediately followed by three large jumps, a slight pause, and then 11 very quick small jumps).

   a. What object in the video can be used to estimate the height of the man's jump? What is your estimate of the object's height? The stair step.
   b. Draw your own graph for this graphing story. Use parts of graphs of quadratic functions to model each of the man's hops. Label your x-axis and y-axis appropriately and give a title for your graph.

   (Answers will vary.)