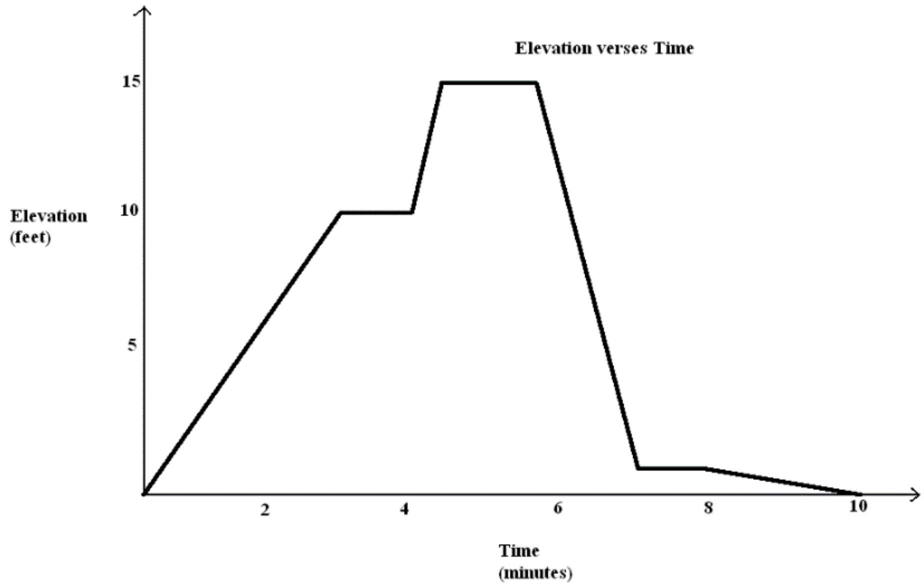
Lesson 1: Graphs of Piecewise Linear Functions

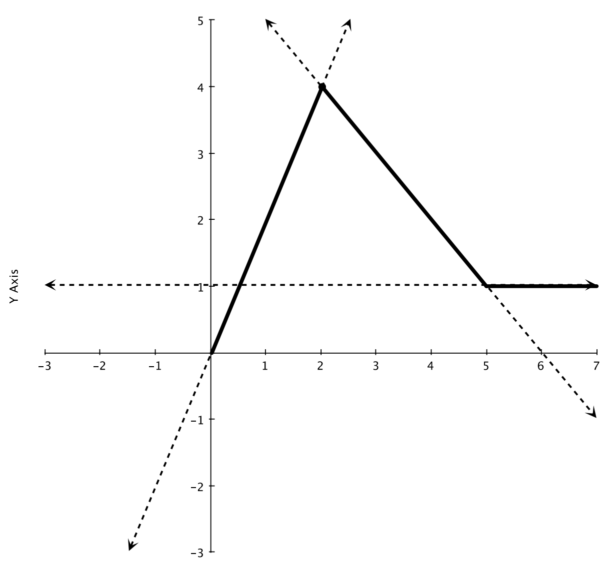
Classwork



Example 1

Here is an elevation-versus-time graph of a person's motion. Describe what the person might have been doing.

__Piecewise-Defined Linear Function__: Given non-overlapping intervals on the real number line, a *(real) piecewise linear function* is a function from the union of the intervals on the real number line that is defined by (possibly different) linear functions on each interval.



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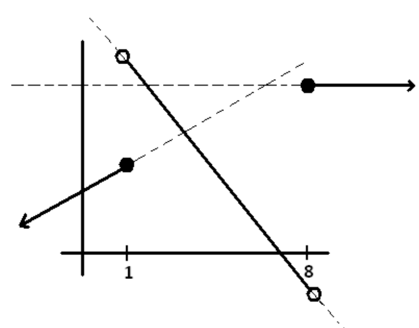


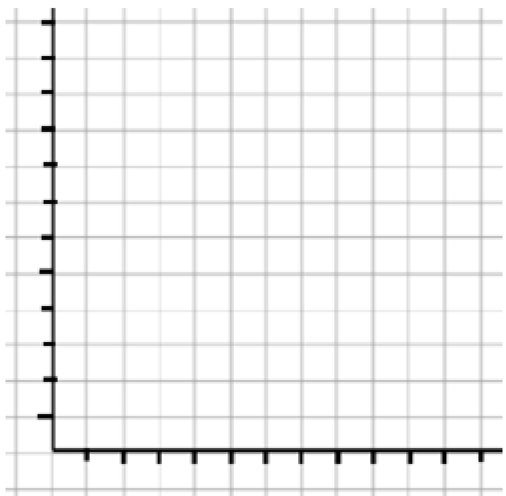
Problem Set

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. After 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.



   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.

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

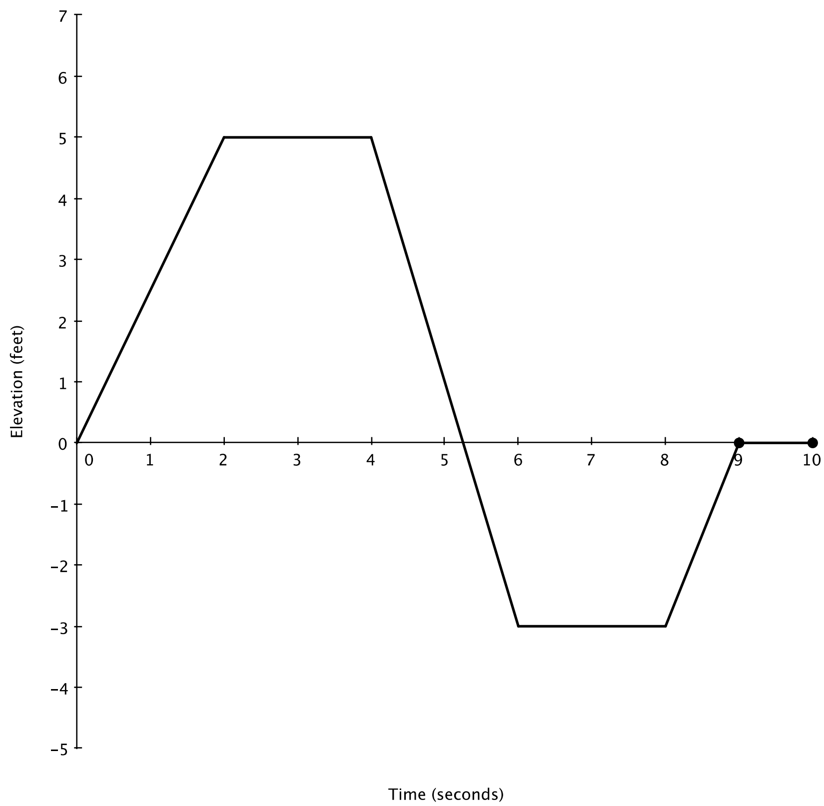
   d. If you measured from the top of the man's head instead (he is 6.2 feet tall), how would your graph change?

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

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?

g. Describe how your graph in part (a) can also be used to find the interval during which he is descending fastest.

2. Create an elevation-versus-time graphing story for the following graph:



3. Draw an elevation-versus-time graphing story of your own, and then create a story for it.