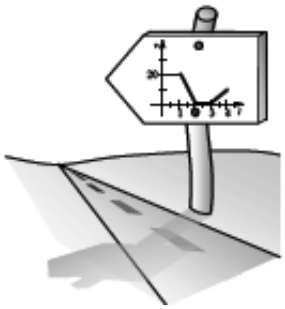
1.4.1 Can you walk the walk?



Distance and Velocity

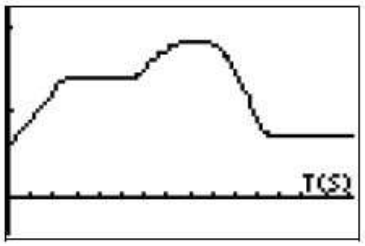
1-133. Shant and Kier each took a 10 second walk and wrote descriptions of their experiences. Complete the tasks below in any order:

- Sketch a graph of each scenario.
- Walk the walk.
- Compare the two walks. Is there a relationship between the two functions?

Shant's Walk: *Start close to the motion detector. Begin walking at a very fast rate and gradually slow down to a stop. Then increase your speed gradually until you are walking as quickly as when you started.*

Kier's Walk: *Start close to the motion detector. Begin walking at a very slow rate and gradually speed up to the fastest speed you can achieve. Then gradually slow down to your starting speed.*

1-134. THE SLOPE WALK, Part Two
During her 15 second Slope Walk, Diamonique walked in front of a motion detector and the graph below appeared.



a. If the graph represents her distance traveled, describe her motion.

   i. State the time interval when Diamonique was walking toward the motion detector? When did she walk away from the motion detector? When did she change directions? Justify your

answers.

ii. On what interval of time was she standing still? Justify your answer.

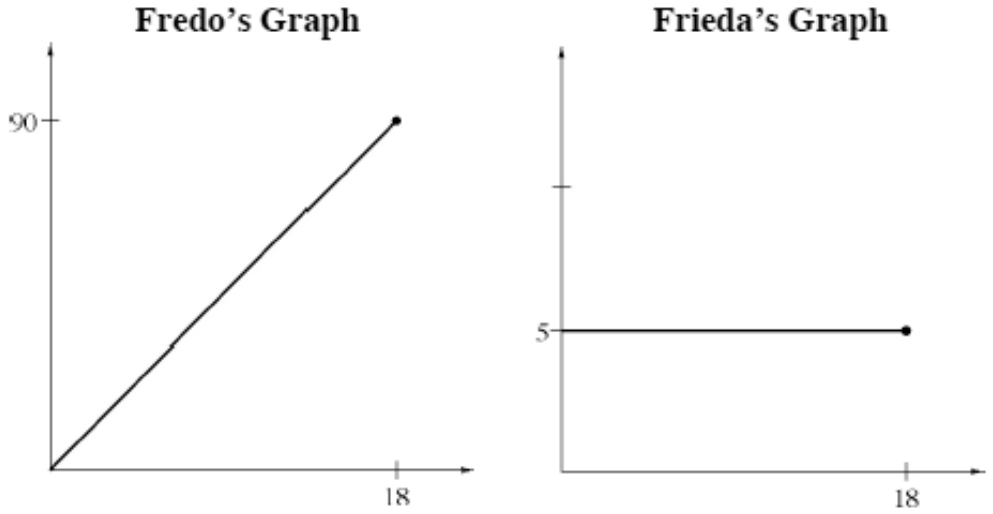
iii. Estimate a time when she was walking fastest. Justify your answer.

iv. Estimate a time when she was slowing down. Justify your answer.

b. Now assume that the graph represents *velocity vs. time*-in other words, let the *y*-axis represent velocity? Similarly describe her motion.

1-135. FUNDAMENTALLY THE SAME

Fredo (short for Alfredo) and Frieda were both given the responsibility to collect data for a foot race. After watching the event, the students gave the coach graphs of their data, shown below.

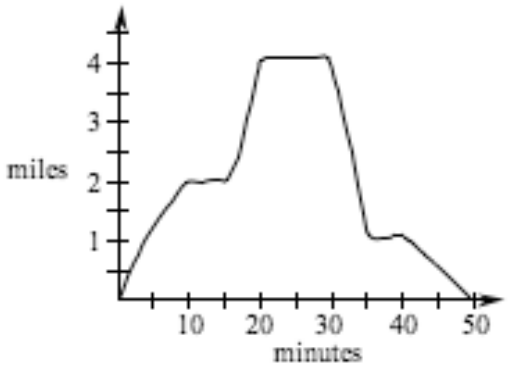


The coach is dismayed because the graphs are different. However, each student is convinced that they watchedthe same race and that their data is confirmed in the other's graph. Your goal is to help the students convince their coach that the graphs represent the same race.

a. To help the coach understand the graphs, label each with the appropriate (and reasonable) units.

b. Explain how Frieda's graph confirms Fredo's *and* how Fredo's graph confirms Frieda's.

1-136. Ellen rode her bike one morning to visit some friends. Her distance from home is documented in the graph below.



a. Estimate her rate (velocity) in miles per hour for times $t = 7$, 32, and 45 minutes. Describe your strategy.

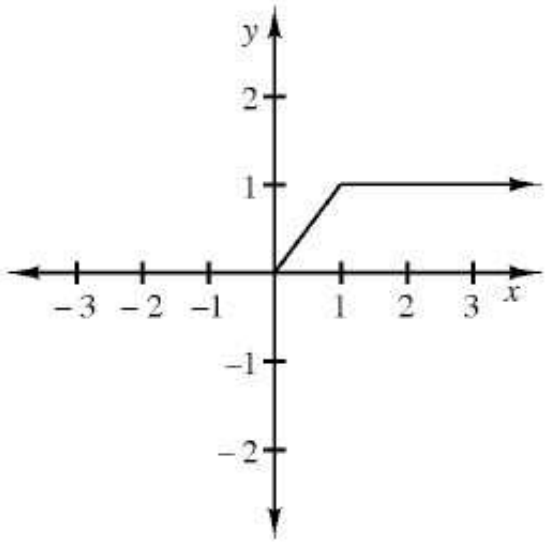
b. How is Ellen's velocity related to the graph of her distance from home?

c. What was her total distance traveled?

1-137. As a team, summarize what you learned about the relationship between distance and velocity from problem 1-135. Be prepared to share your statements with the class. Problem 1-135 demonstrated a powerful calculus concept: that distance information can come from a velocity graph and velocity information can come from a distance graph. Therefore, at least for simplistic problems, we can determine one from the other using only the basic geometric tools of slope and area.

For the remainder of this chapter, each direction will be examined closely so that some new properties of motion emerge. Central to this work will be the meaning of the terms position/distance and velocity. Define these terms in your own words. Give examples to help clarify your meaning.

1-138. Given a portion of the graph of $f(x)$ below: Homework Help



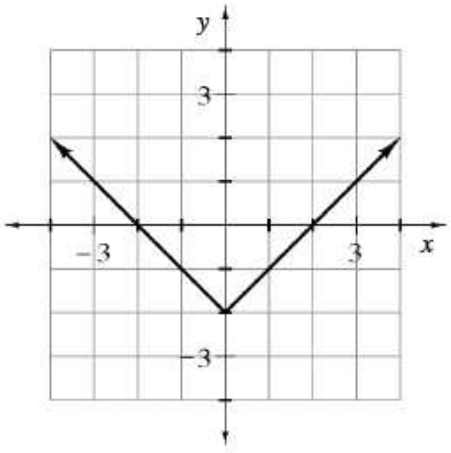
a. Sketch the rest of $f(x)$ if $f(x)$ is even and find $A(f, -3 \le x \le 3)$.

b. Sketch the rest of $f(x)$ if $f(x)$ is odd and find $A(f, -3 \le x \le 3)$.

1-139. Find values of a that that make $h(x)$ continuous. Homework Help

$$h(x) = \begin{cases} \sqrt{x+2} - 1 & \text{for } x < 2 \\ a(x+1)^2 & \text{for } x \ge 2 \end{cases}$$

1-140. Given the function $f(x)$ sketched below, Homework Help



a. Sketch $f(-x)$.

b. Sketch $-f(x)$.

c. Sketch $f(f(x))$.

1-141. Find the domain for each of the following functions. Note: The functions mentioned in parts (c)

and (d) refer to those in parts (a) and (b). Homework Help ✎

a. $f(x)=\frac{1}{x+2}$

b. $g(x)=\sqrt{x-4}$

c. $h(x)=f(g(x))$

d. $k(x)=g(f(x))$

1-142. For each function, use algebra to identify all holes and asymptotes. Homework Help ✎

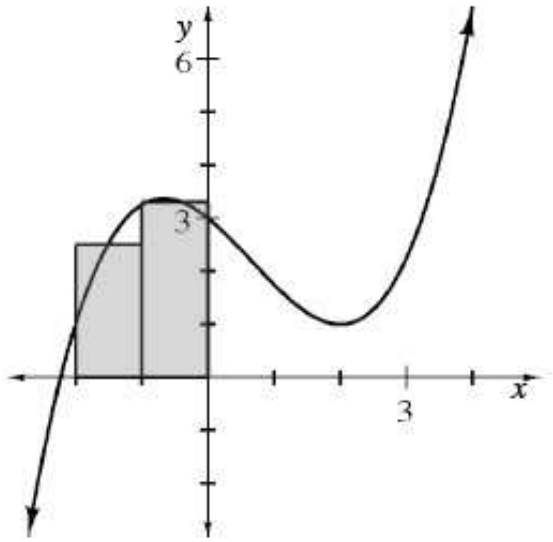
a. $f(x)=\frac{x-3}{x^2+4x-21}$

b. $g(x)=\frac{x^{4/3}}{x^2-2x}$

1-143. Velocity is only one example of a rate of change. Name at least two other familiar rates that you encounter in your daily life. Homework Help ✎

1-144. Let $f(x)$ be a function whose finite differences grow by 4 each time. What kind of function can $f(x)$ be? Give two examples. Homework Help ✎

1-145. Cynthia began to draw midpoint rectangles to approximate $A(f, -2 \le x \le 4)$ for $f(x)=\frac{1}{4}x^3-\frac{1}{2}x^2-x+3$. Trace Cynthia's graph and finish drawing the remaining four midpoint rectangles. Then, compute the estimated area. Homework Help ✎



1-146. Each of these functions has one or more holes and/or asymptotes. Graph them on your graphing calculator and write a complete set of approach statements for each function. Homework Help ✎

a. $f(x)=\frac{2^x}{x}$

b. $f(x) = \frac{2^x - 1}{x}$