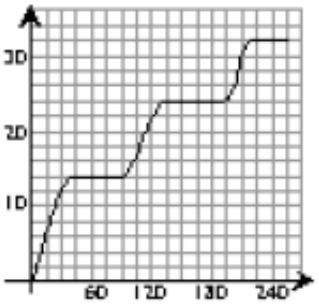
1.5.1 How do position and velocity relate?

Area and Slope

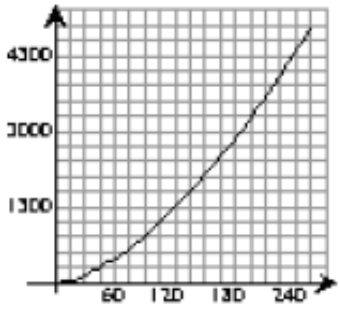
1-190. FREDO AND FRIEDA RETURN

Fredo and Frieda each recorded data for a different race. Their data is shown below and this time the students are not so sure their data matches. The coach has turned to you for help. Decide which student measured distance and which measured velocity. Create ways to decide if the graphs represent the same data. Be prepared to share your methods to confirm whether the data collected by each student matches the others.

Fredo's Graph



Frieda's Graph



1-191. College Admissions Writing Prompt

Liebniz University in Newton, North Calculina has a unique requirement for math majors. In order to receive credit for scoring well on the AP Calculus exam, students must demonstrate understanding of the following topic through a formal essay.

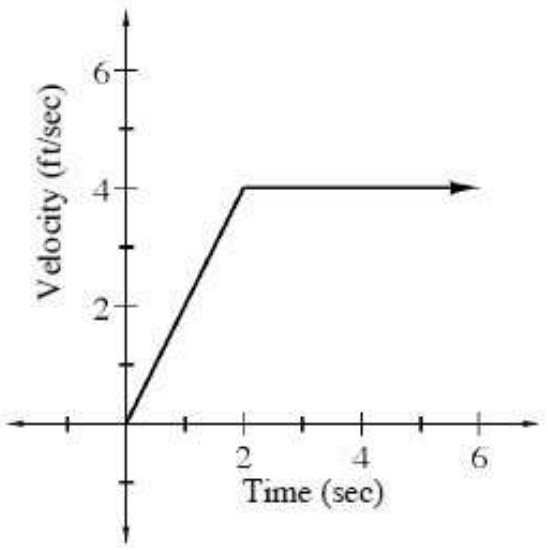
Please respond to the following prompt. Note: If you include graphs to illustrate your ideas, make sure they are well labeled.

- What is the relationship between position and velocity?
- How can velocity information be determined from a position graph? What about speed?
- How can position information be determined from a velocity graph?

Be sure to draw distinctions between actual position, displacement, and total distance. What extra information do you need to determine actual position from a velocity graph?

1-192. So far in this chapter, you have determined information about acceleration and distance from a

velocity graph. You have developed ways to find total distance or displacement. This time, however, we want to find a function of the distance over time. Using the graph:



a. Find a piecewise function for $v(t)$.

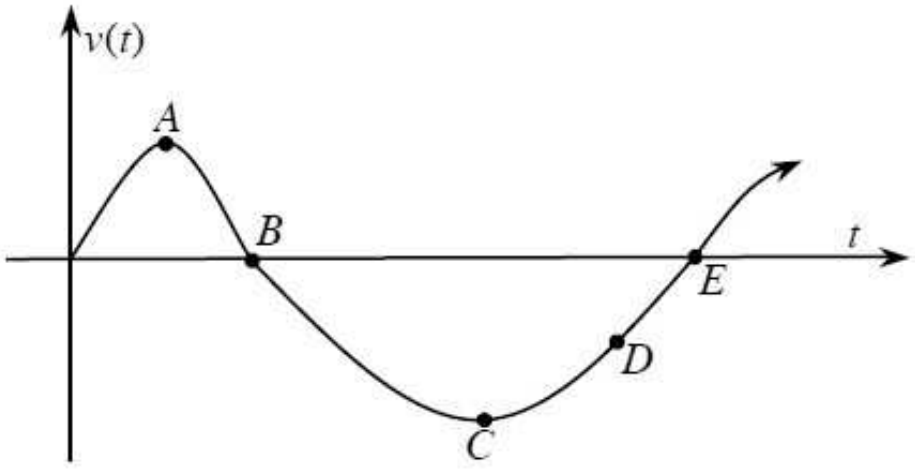
b. Assuming that $d(0) = 0$, copy and complete the table below for distance traveled over time.

t	0	0.5	1	1.5	2	3	4	5	6
$d(t)$					4				20

c. Plot the distance verses time graph $d(t)$ from the table completed in part (b).

d. Assuming that $d(0) = 0$, find the piecewise function for the distance versus time graph.

1-193. A particle is moving along a straight line. The velocity of the particle is shown on the graph below.



a. At what point is the velocity greatest?

b. At what point is the speed greatest?

c. Where does the particle change from moving forward to moving backward?

d. Where is acceleration positive?

1-194. NOT AGAIN!
Theo has done it again. Before he lost his graph, he used it to determine the following properties of his motion. Help him re-create a possible graph of this motion. Homework Help

DETAILS:

- He changed directions three times during his 8-foot walk.
- His average velocity was 0 feet per second.
- Theo walked for 6 seconds and started 5 feet from the motion detector.

1-195. Carefully graph $f(x)=\begin{cases}\sqrt{x} & \text{for } 0<x<4\\ (x-6)^2-2 & \text{for } 4\le x<10\end{cases}$ on your paper. Then, write a detailed slope statement. 1-195 HW eTool (Desmos). Homework Help

1-196. Given the tables below, Homework Help

x	−2	−1	0	1	2	3	10	100
$f(x)$	−11	−8	−5	−2	1	4	25	295

x	−3	−2	−1	0	1	2	3	12
$g(x)$	−5	0	3	4	3	0	−5	−140

x	-2π	$-\pi$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π	12π

$h(x)$	2	−2	2	0	−2	0	2	2

a. Find possible functions for $f(x)$, $g(x)$, and $h(x)$.

b. Evaluate:

i. $f(g(h(\pi)))$

ii. $h(g^{-1}(4))$

iii. $f^{-1}(h(\pi))$

1-197. The population of Smalltown on January 1st for 5 years is shown in the table below. Homework Help ✎

a. Write a slope statement for the given data.

b. Find the average rate of growth of the population between 1995 and 1999.

c. Approximate the rate of increase of the population on January 1st, 1998. Explain how you got your answer.

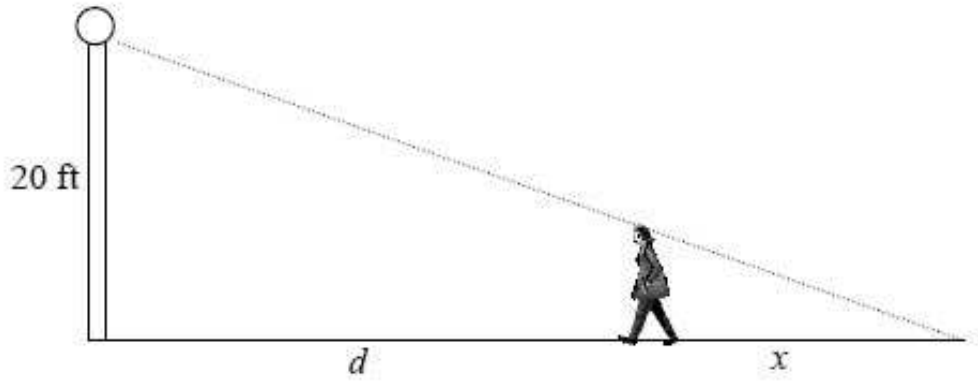
1995	2300
1996	2415
1997	2536
1998	2663
1999	2796

1-198. Draw *two different* distance graphs that each has an average velocity of 5 meters per minute. 1-198 HW eTool (Desmos). Homework Help ✎

1-199. The area between the x-axis and $f(x) = -|x-3|+5$ forms a flag. Find the volume generated when the flag is rotated about the x-axis. Homework Help ✎

1-200. Find non-trivial functions $f(x)$ and $g(x)$ such that $f(g^{-1}(x)) = \sqrt{3x-2}+6$. Homework Help ✎

1-201. Shehazana, who is five and a half feet tall, is walking toward a 20-foot streetlight. Solve for the length of her shadow, x, in terms of the distance, d, she is from the pole. Homework Help ✎



1-202. Find the domain of the following functions: Homework Help ✎

a. $f(x) = \sec x$

b. $g(x) = \log(x^2 + 1)$

c. $h(x) = \frac{x^2-4}{x^2-x-6}$

d. $k(x) = \frac{\log(x-1)}{\sqrt{x^2-16}}$

1-203. Multiple Choice: When the graph of $f(x) = 1 - 2^x$ is reflected across the y-axis, the resulting graph is: Homework Help ✎

a. $g(x) = 1 - 0.5^x$

b. $g(x) = 1 + 2^x$

c. $g(x) = 2^x - 1$

d. $g(x) = \log_2(x - 1)$

e. $g(x) = \log_2(1 - x)$