

Lesson 14: Motion Along a Line—Search Robots Again

Classwork

Opening Exercise

- If $f(t) = (t, 2t - 1)$, find the values of $f(0)$, $f(1)$, and $f(5)$, and plot them on a coordinate plane.
- What is the image of $f(t)$?
- At what time does the graph of the line pass through the y -axis?
- When does it pass through the x -axis?
- Can you write the equation of the line you graphed in slope y -intercept form?
- How does this equation compare with the definition of $f(t)$?

Example 1

Programmers want to program a robot so that it moves at a uniform speed along a straight line segment connecting two points A and B . If $A(0, -1)$ and $B(1,1)$, and the robot travels from A to B in $t = 1$ minute,

- Where is the robot at $t = 0$?
- Where is the robot at $t = 1$?
- Draw a picture that shows where the robot will be at $0 < t < 1$.

Exercise 1

A robot is programmed to move along a straight line path through two points A and B . It travels at a uniform speed that allows it to make the trip from $A(0, -1)$ to $B(1,1)$ in $t = 1$ minute. Find the location, P , when

a. $t = \frac{1}{4}$

b. $t = 0.7$

Example 3

A programmer wants to program a robot so that it moves at a constant speed along a straight line segment connecting the point $A(30,60)$ to the point $B(200,100)$ over the course of a minute.

At time $t = 0$, the robot is at point A .

At time $t = 1$, the robot is at point B .

a. Where will the robot be at time $t = \frac{1}{2}$?

b. Where will the robot be at time $t = 0.6$?

Problem Set

- Find the coordinates of the intersection of the medians of $\triangle ABC$ given $A(2,4)$, $B(-4,0)$, and $C(3,-1)$.
- Given a quadrilateral with vertices $A(-1,3)$, $B(1,5)$, $C(5,1)$, and $D(3,-1)$:
 - Prove that quadrilateral $ABCD$ is a rectangle.
 - Prove that $(2,2)$ is a point on both diagonals of the quadrilateral.
- The robot is programmed to travel along a line segment at a constant speed. If P represents the robot's position at any given time t in minutes:

$$P = (240, 60) + \frac{t}{10}(100, 100),$$

- What was the robot's starting position?
 - Where did the robot stop?
 - How long did it take the robot to complete the entire journey?
 - Did the robot pass through the point $(310, 130)$ and, if so, how long into its journey did the robot reach this position?
- Two robots are moving along straight line paths in a rectangular room. Robot 1 starts at point $A(20,10)$ and travels at a constant speed to point $B(120, 50)$ in two minutes. Robot 2 starts at point $C(90,10)$ and travels at a constant speed to point $D(60,70)$ in 90 seconds. If the robots begin their journeys at the same time, will the robots collide? Why or why not?