LESSON MAKER PRO

Follow the Curve

Sketch parametric paths and show how they move.

HIGH SCHOOL · MA.912.T.4.5

MA.912.T.4.5 "Sketch the graph of a curve in the plane represented parametrically, indicating the direction of motion."

NAME _____ DATE _____

TRACK THE PARAMETER

Use several parameter values to locate points, then connect the points in the order that t increases. You can also eliminate t to identify the curve, but arrows must show the direction of motion.

WORKED EXAMPLE

Sketch the curve x=5t-4, y=t+6. Indicate the direction as t increases.

1. From x=5t-4, t=(x+4)/5.
2. Substitute: y=(x+4)/5+6=(x+34)/5.
3. The graph is the line x-5y=-34.
4. Both x and y increase as t increases, so draw arrows up and to the right.

Answer: Line y=(x+34)/5, with direction up and right as t increases.

PRACTICE 6 problems

1 Sketch the curve x=t, y=-t for all t. Add arrows to show the direction of motion.

ANSWER _____

2 Sketch the curve x=t, y=t^2 for all t. Add arrows to show the direction of motion.

ANSWER _____

3 Sketch the curve x=t^2, y=t for all t. Add arrows to show the direction of motion.

ANSWER _____

4 Sketch the curve x=cos t, y=sin t for 0<=t<=pi. Add arrows to show the direction of motion.

ANSWER _____

5 Sketch the curve x=sin t, y=cos t for 0<=t<=pi. Add arrows to show the direction of motion.

ANSWER _____

6 Sketch the curve x=t^3, y=t^2 for all t. Add arrows to show the direction of motion.

ANSWER _____

APPLY IT Show your work

1 A gaming club models a virtual ball's position in game units by x=3t and y=3t-t^2, where 0<=t<=3. Sketch the ball's path and show its direction.

WORK SPACE

ANSWER _____

2 On a campus scavenger-hunt app, a student's location is modeled by x=t^2 and y=10-t, where 0<=t<=3. Sketch the route and show its direction.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A music visualizer uses x=cos(2t), y=sin(2t) for 0<=t<=2pi. Sketch the curve, indicate direction, and explain whether any part of the curve is traced more than once.

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ANSWER KEY

Follow the Curve

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch the curve x=t, y=-t for all t. Add arrows to show the direction of motion.	**Line y=-x, moving down and to the right as t increases.**
2	Sketch the curve x=t, y=t^2 for all t. Add arrows to show the direction of motion.	**Parabola y=x^2, moving from the upper left toward the origin, then from the origin toward the upper right.**
3	Sketch the curve x=t^2, y=t for all t. Add arrows to show the direction of motion.	**Sideways parabola x=y^2, moving from the lower right toward the origin, then from the origin toward the upper right.**
4	Sketch the curve x=cos t, y=sin t for 0<=t<=pi. Add arrows to show the direction of motion.	**Upper semicircle x^2+y^2=1 from (1,0) to (-1,0), moving counterclockwise.**
5	Sketch the curve x=sin t, y=cos t for 0<=t<=pi. Add arrows to show the direction of motion.	**Right semicircle x^2+y^2=1 from (0,1) to (0,-1), moving clockwise.**
6	Sketch the curve x=t^3, y=t^2 for all t. Add arrows to show the direction of motion.	**Curve x^2=y^3, moving along the left branch toward the origin, then along the right branch away from the origin.**

PART 2 · APPLY IT

1. **The path is y=x-x^2/9 for 0<=x<=9. It starts at (0,0), moves left to right along a downward-opening arc, and ends at (9,0).** Use t=x/3 in the equation for y. Since t increases from zero to three, x increases from zero to nine.
2. **The route is x=(10-y)^2, beginning at (0,10) and ending at (9,7). It moves down and to the right along part of a sideways parabola.** Use t=10-y in the equation for x. Compare the coordinates at the beginning and end of the parameter interval to determine direction.

CHALLENGE

The curve is the circle x^2+y^2=1. It starts at (1,0), moves counterclockwise, and traces the entire circle twice because the angle 2t runs through two full revolutions; the point returns to (1,0) when t=pi and again at the end.

Accept equivalent rectangular equations and accurate sketches with correctly placed direction arrows. For paths restricted by a parameter interval, accept a clearly marked arc or branch with correct endpoints and direction.