

Curve Switch Lab

Move between parametric and rectangular equations.

HIGH SCHOOL • MA.912.T.4.6

MA.912.T.4.6 "Convert from a parametric representation of a plane curve to a rectangular equation, and convert from a rectangular equation to a parametric representation of a plane curve."

NAME _____

DATE _____

SWITCHING FORMS

To change parametric equations into a rectangular equation, solve one equation for t and substitute into the other equation. To write a parametric form for a line, you can often set x or y equal to t . For a circle centered at the origin, $x = r \cos t$ and $y = r \sin t$ give $x^2 + y^2 = r^2$.

WORKED EXAMPLE

Convert $x = 11 + 10t$ and $y = 12 - 13t$ to a rectangular equation.

1. Solve $x = 11 + 10t$ for t : $t = (x - 11)/10$.
2. Substitute: $y = 12 - 13(x - 11)/10$.
3. Multiply by 10 and simplify: $13x + 10y = 263$.

Answer: $13x + 10y = 263$

PRACTICE 6 problems

- 1** Convert $x = 4t - 5$ and $y = 6t + 7$ to a rectangular equation.

ANSWER _____

- 2** Write a parametric representation for $y = -9x + 14$.

ANSWER _____

- 3** Convert $x = 15 - t$ and $y = 8t - 16$ to a rectangular equation.

ANSWER _____

- 4** Write a parametric representation for $x^2 + y^2 = 81$.

ANSWER _____

- 5** Convert $x = 17 + 7t$ and $y = 25 + 21t$ to a rectangular equation.

ANSWER _____

- 6** Write a parametric representation for $x = 5y - 4$.

ANSWER _____

APPLY IT Show your work

- 1** In a coordinate-based video game, a character moves according to $x = 6t - 18$ and $y = 9t + 5$. Write the rectangular equation for the character's path.

WORK SPACE

ANSWER _____

- 2** A student designs an animated logo that follows the equation $x^2/36 + y^2/64 = 1$. Write one parametric representation for the logo's path.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Convert $x = 7 + 4t$ and $y = 2 - 3t$ to a rectangular equation. Then explain whether the point $(15, -4)$ lies on the curve.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Convert $x = 4t - 5$ and $y = 6t + 7$ to a rectangular equation.	$3x - 2y = -29$
2	Write a parametric representation for $y = -9x + 14$.	$x = t, y = -9t + 14$
3	Convert $x = 15 - t$ and $y = 8t - 16$ to a rectangular equation.	$8x + y = 104$
4	Write a parametric representation for $x^2 + y^2 = 81$.	$x = 9 \cos t, y = 9 \sin t$
5	Convert $x = 17 + 7t$ and $y = 25 + 21t$ to a rectangular equation.	$y = 3x - 26$
6	Write a parametric representation for $x = 5y - 4$.	$x = 5t - 4, y = t$

PART 2 · APPLY IT

1. **$3x - 2y = -64$** Solve $x = 6t - 18$ for t , then substitute into the equation for y . Simplifying gives $3x - 2y = -64$.
2. **$x = 6 \cos t, y = 8 \sin t$** The horizontal radius is 6 and the vertical radius is 8. Use cosine for x and sine for y .

CHALLENGE

$3x + 4y = 29$. Since $3(15) + 4(-4) = 29$, the point $(15, -4)$ lies on the curve.

Accept any equivalent rectangular equation obtained by multiplying both sides by the same nonzero constant. For parametric answers, accept equivalent forms that trace the same curve.