

Student Workbook

Parametric Equations

Name: _____

Date: _____

Period: _____

Learning Target: I can evaluate parametric equations and eliminate the parameter to find a rectangular equation.

Vocabulary

Term	Meaning
Parameter	A third variable (often t , for time) that both x and y depend on.
Parametric Equations	A pair of equations $x=f(t)$, $y=g(t)$ that together trace a curve.
Eliminating the Parameter	Combining the two equations into one rectangular equation relating x and y directly.

Key Concept: Eliminating the Parameter

METHOD Solve one equation for t , then substitute that expression into the other equation.

EXAMPLE 1
 $x = t+1$, $y = t^2-2$. Eliminate the parameter.

$t = \rule{1.5cm}{0.4pt} \rightarrow y = \rule{2.5cm}{0.4pt}$

Key Concept: Trig Parametric Equations (Circles)

USE THE PYTHAGOREAN IDENTITY If $x=r\cos(t)$ and $y=r\sin(t)$, then $x^2+y^2=r^2(\cos^2t+\sin^2t)=r^2$.

EXAMPLE 2
 $x = 3\cos(t)$, $y = 3\sin(t)$. Eliminate the parameter.

$x^2+y^2 = 9\cos^2t + 9\sin^2t = 9(\cos^2t+\sin^2t) = \rule{1.5cm}{0.4pt}$

COMMON MISTAKE

Don't forget to substitute your solved-for t expression into BOTH remaining instances of t (if there are more than one) — and always double check by testing a specific t -value in both the original and final equations.

Key Concept: Evaluating at a Given t -Value

EXAMPLE 3

$x = t^2$, $y = 2t - 1$. Find the point when $t = 3$.

$x = \underline{\hspace{2cm}}$ $y = \underline{\hspace{2cm}}$ $\rightarrow$ Point: ($\underline{\hspace{2cm}}$, $\underline{\hspace{2cm}}$)

Guided Practice — Part A: Eliminate the Parameter (Linear)

A1 $x = t + 2$, $y = 3t - 1$

A2 $x = 2t - 3$, $y = t + 4$

Guided Practice — Part B: Eliminate the Parameter (Quadratic)

B1 $x = t - 1$, $y = t^2 + 2$

B2 $x = t + 3$, $y = 2t^2 - 1$

Guided Practice — Part C: Eliminate the Parameter (Circles)

C1 $x = 4\cos(t)$, $y = 4\sin(t)$

C2 $x = 5\cos(t)$, $y = 5\sin(t)$

Guided Practice — Part D: Evaluate at a Given t

D1 $x=t^2+1$, $y=3t-2$. Find the point at $t=2$.

D2 $x=2t-1$, $y=t^2+3$. Find the point at $t=-1$.

BEFORE YOU MOVE ON

Check with a partner: after eliminating the parameter, did you verify your rectangular equation by plugging in a specific t -value?