Warm up

Find the compositions using the following functions

$f(x) = x^2 - 1$ $g(x) = 2x - 3$ $h(x) = \sqrt{x - 1}$

1) f(g(x)) $f(2x-3)$ $(2x-3)^2-1$

2) h(f(x)) $h(x^2-1)$ $\sqrt{x^2-1-1}$ $\sqrt{x^2-2}$

3) g(h(x)) $g(\sqrt{x-1})$ $2\sqrt{x-1}-3$

4) f(h(x)) $f(\sqrt{x-1})$ $x-2$

Objective: Evaluate and graph parametric equations.
Eliminate the parameter and put in rectangular form.

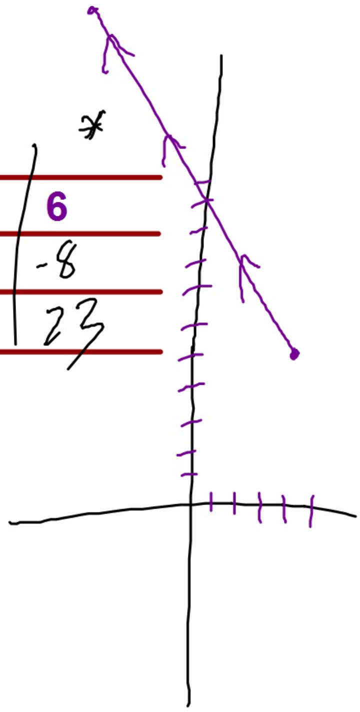
A parametric equation has a third variable which is the parameter.

This third variable is usually t and represent time.

Complete the table and graph the function

x = 4 – 2t   y = 5 + 3t

t	0	1	2	3	4	5	6
x	4	2	0	-2	-4	-6	-8
y	5	8	11	14	17	20	23



Complete the table and graph the function

$x = t + 1$ $y = t^2 + 1$

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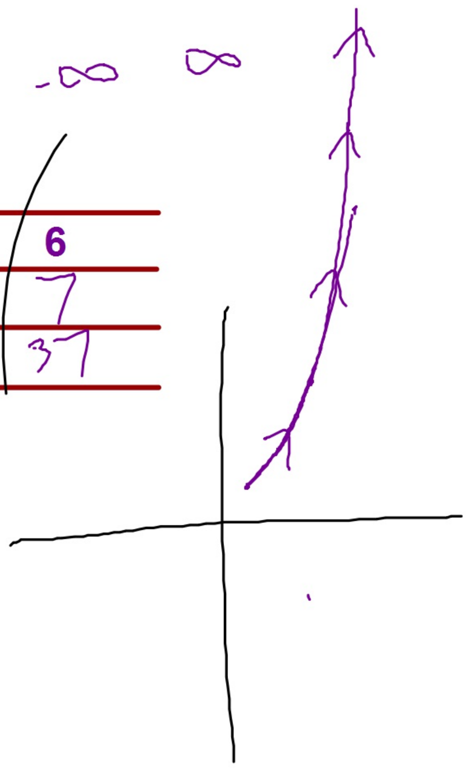
t	0	1	2	3	4	5	6
x	1	2	3	4	5	6	7
y	1	2	5	10	17	26	37



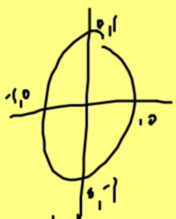
Sketch and identify the curve defined by the parametric equations

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

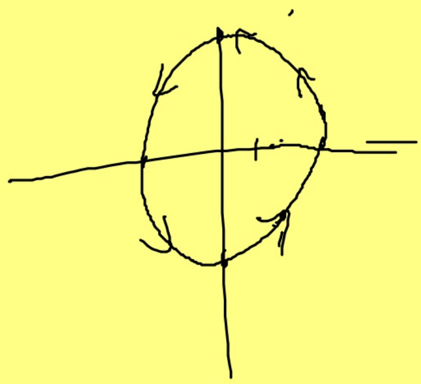
t	-2	-1	0	1	2	3	4

Examples:

x = 3cosθ **y = 4sinθ** **0 < θ < 2π**



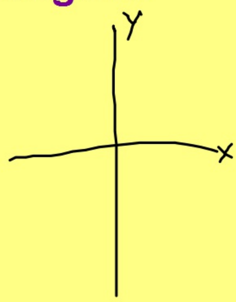
θ	0	π/4	π/2	3π/4	π	5π/4	3π/2	7π/4	2π
x	3	2.12	0	-2.12	-3	-2.12	0	2.12	3
y	0	2.83	4	2.83	0	-2.83	-4	-2.83	0



Eliminate the parameter

1. Solve for t in one equation

2. Substitute into second and you have a rectangular equation



Example $x = t + 1$ $\quad y = t^2 + 1$

$t = x - 1$

$y = (x-1)^2 + 1$

$y = x^2 - 2x + 2$

Writing a rectangular in parametric form

State the parametric equation for: $\mathbf{y = 2x^2 - 2x}$

given $\mathbf{t = 1 + x}$ as one parameter.

Parametric with Trig Values

The parameter when using Trig will be θ.
Usually between 0 and 2π or 0° and 360°

To eliminate the parameter use your pythagorean identities

Practice: make a table and graph each set of parametric equations.
Write each in rectangular form.

1. $x = 3\cos\theta \quad y = 5\sin\theta$

2. $x = 10\cos\theta \quad y = 5\sin\theta$

3. $x = 4\cos\theta + 2 \quad y = 4\sin\theta + 4$

2) $\frac{x^2}{100} + \frac{y^2}{25} = 1$

$\frac{x-2}{4} = \cos\theta$

$\frac{y-4}{4} = \sin\theta$

$\frac{(x-2)^2}{16} + \frac{(y-4)^2}{16} = 1$

Writing a rectangular in parametric form

1. set t = x for your first equation
2. replace t in for x into your original equation

Example 1. $y = x^2 - 1$

$x = t$

$y = t^2 - 1$

In Exercises 5 and 6, **(a)** complete the table for the parametric equations and **(b)** plot the corresponding points.

5. $x = t + 2,\ y = 1 + 3/t$

t	-2	-1	0	1	2

In Exercises 11–26, eliminate the parameter and identify the graph of the parametric curve.

11. $x = 1 + t,\ y = t$

12. $x = 2 - 3t,\ y = 5 + t$

13. $x = 2t - 3,\ y = 9 - 4t, \quad 3 \le t \le 5$

14. $x = 5 - 3t,\ y = 2 + t, \quad -1 \le t \le 3$

15. $x = t^2,\ y = t + 1$ [*Hint:* Eliminate t and solve for x in terms of y.]

16. $x = t,\ y = t^2 - 3$

17. $x = t,\ y = t^3 - 2t + 3$

18. $x = 2t^2 - 1,\ y = t$ [*Hint:* Eliminate t and solve for x in terms of y.]

23. $x = 5 \cos t,\ y = 5 \sin t$

24. $x = 4 \cos t,\ y = 4 \sin t$

25. $x = 2 \sin t,\ y = 2 \cos t, \quad 0 \le t \le 3\pi/2$

In Exercises 27–32 find a parametrization for the curve.

32. The circle with center $(-2, -4)$ and radius 2.