Parametric Equations

Definition:
If x=f(t) and y = g(t) over a specified interval of t-values, then the graph (x,y) = (f(t), g(t)) is a parametric curve and f(t) and g(t) are called parametric equations.

Again "t" is a "parameter" for x and y. "t" will be defined for a specific interval or "parametric interval"

The (x,y) pair given by the beginning and end points of the interval are called the initial and terminal points, respectively.

If we write a curve using a parameter, we have parametrized. Together the equations and the interval are called parametrization.

Your grapher will always graph end points.

Consider

$$x = t - 2$$
$$y = 2t + 1$$
$$for -1 \le t \le 3$$

$$x = 2\cos(t)$$
$$y = 2\sin(t)$$
$$for 0 \le t \le 2\pi$$

Exploration 1

What about Ellipses?

$$x = 2\cos(t)$$
$$y = 4\sin(t)$$
$$for 0 \le t \le 2\pi$$

Example 4 page 32

Draw the graph of

$x = 1 - t \qquad y = -2t \qquad 0 \le t \le 1$

Relate this to what we already know about graphs.

$x = 1 - t \rightarrow x - 1 = -t \quad -x + 1 = t$

$y = -2t \; y = -2(-x + 1) \qquad y = 2x - 2$

But only from (1,0) to (0,-2)
Because of the parameters we don't have a line only a line segment.

How can we get this parametrization to graph the whole line?

How do we parametrize?

Example 5 page 32.
(-2,1) and (3,5)

X=-2+at y=1+bt
Linear a is Δx b is Δy
(Solve for t.)

$$\frac{x+2}{a} = t \qquad \frac{y-1}{b} = t$$

$$\frac{x+2}{a} = \frac{y-1}{b}$$

Determine a and b by plugging in (3,5)
3=-2 +a 5=1+b
a=5 b=4
So….
x=-2+5t y=1+4t $0 \le t \le 1$