pRE-calculus NOTES day 1 NAME: key

paRamEtRic cuRvES pERiod: ____

Definition: **Parametric Curve, Parametric Equations**

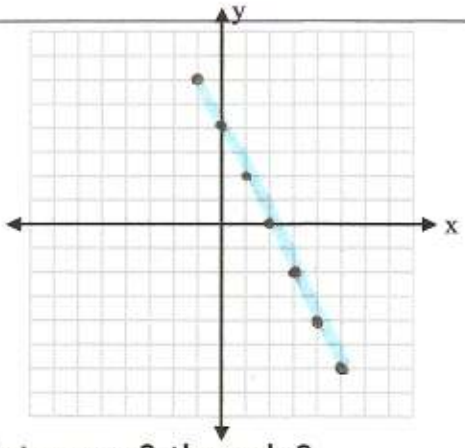
The graph of the ordered pairs x, y where $x = f(t)$ and $y = g(t)$ are functions defined on an interval I of t-values is a **parametric curve**. The equations are **parametric equations** for the curve, the variable t is a **parameter**, and I is the **parameter interval**.

Example 1: BY HAND.

$x(t) = 2 - t$ AND $y(t) = 2t$

Fill in the table of values.

t	-3	-2	-1	0	1	2	3
x	5	4	3	2	1	0	-1
y	-6	-4	-2	0	2	4	6



Using the chart above, the domain for "t" consists of the integers -3 through 3.
Therefore, our graph consists of points.
If we change the domain of "t" to $[-3,3]$ (the real numbers between -3 and 3), the graph becomes a line segment with endpoints (5, -6) and (-1, 6).
The domain of the curve is [-1, 5]. The range of the curve is [-6, 6].
If you eliminate "t", what would the equation become?

$x = 2 - t$

$x - 2 = -t$

$-x + 2 = t$

$y = 2t$

$y = 2(-x + 2)$

$\boxed{y = -2x + 4}$

Is this a function? yes Why or why not? passes VLT

Example 2: BY CALCULATOR (same equations).

1. Go to "MODE" and change to parametric mode - "PAR"
2. Go to "y=" and put in $x(t)$ and $y(t)$.
3. Got to WINDOW and looking at your chart above, let's set our window.

T min = -3 T max = 3 T step = .1 ← changes how quickly calc. graphs

X min = -2 X max = 6 X step = 1

Y min = -7 Y max = 7 Y step = 1

making sure to see the endpts

4. Now graph and check your graph against the calculator graph.
5. Check your table above against the calculator table.

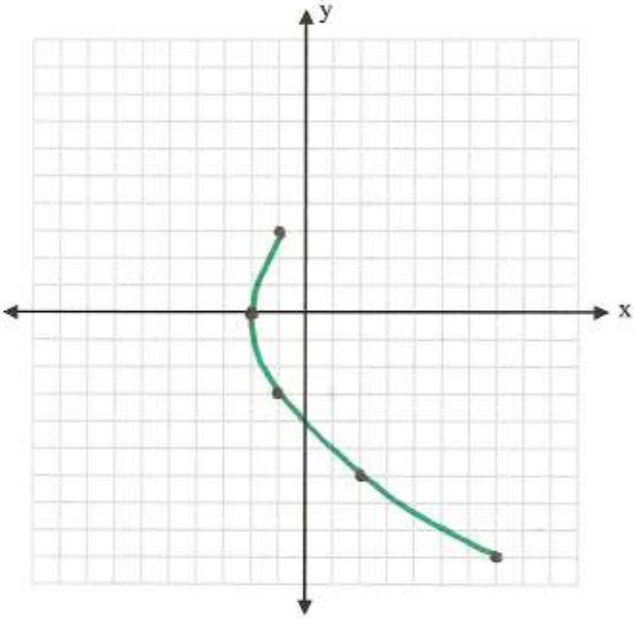
Graphing Parametric Equations BY HAND and USING THE CALCULATOR

Example 3: For the given parameter interval, graph the parametric equations.

$x = t^2 - 2$ AND $y = 3t$

a. $-3 \le t \le 1$

t	-3	-2	-1	0	1
x	7	2	-1	-2	-1
y	-9	-6	-3	0	+3



Endpoints:
(7, -9) and (-1, 3)

Domain:
[-2, 7]

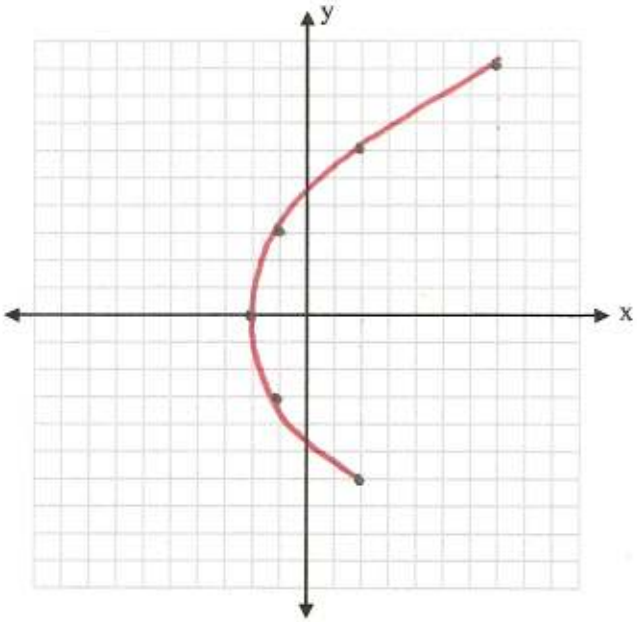
Range:
[-9, 3]

Function? Why or why not?

no; fails VLT

b. $-2 \le t \le 3$

t	-2	-1	0	1	2	3
x	2	-1	-2	1	2	7
y	-6	-3	0	3	6	9



Endpoints:
(2, -6) and (7, 9)

Domain:
[-2, 7]

Range:
[-6, 9]

Function? Why or why not?

no; fails VLT

For the parametric equations in the above example, eliminate the parameter. What would the equation become?

$\frac{y}{3} = \frac{3t}{3}$

$t = \frac{y}{3}$

$x = t^2 - 2$

$x = \left(\frac{y}{3}\right)^2 - 2$

$\boxed{x = \frac{y^2}{9} - 2}$