Parametric Equations

Name Key

Date _____

Find each point based on the parametric equations:

1.) $x = 4 - 3t$ and $y = 2t + 5$

a.) $t = 3$

$x = 4 - 3(3)$ $y = 2(3) + 5$

$x = -5$ $y = 11$

$(-5, 11)$

b.) $t = -2$

$x = 4 - 3(-2) = 10$

$y = 2(-2) + 5 = 1$

$(10, 1)$

2.) $x = t^2 + 5t$ and $y = 3 - t^2$

a.) $t = -1$

$x = (-1)^2 + 5(-1) = -4$

$y = 3 - (-1)^2 = 2$

$(-4, 2)$

b.) $t = 0$

$x = 0$

$y = 3$

$(0, 3)$

3.) $x = t^3 - 4t$ and $y = \sqrt{t + 1}$

a.) $t = 3$

$x = 3^3 - 4(3) = 15$

$y = \sqrt{3+1} = 2$

$(15, 2)$

b.) $t = 15$

$x = 15^3 - 4(15) = 3315$

$y = \sqrt{15+1} = 4$

$(3315, 4)$

4.) $x = |t + 3|$ and $y = \frac{1}{t}$

a.) $t = -8$

$x = |-8 + 3| = 5$

$y = \frac{1}{-8}$

$(5, -\frac{1}{8})$

b.) $t = \frac{1}{2}$

$x = |\frac{1}{2} + 3| = 3.5$

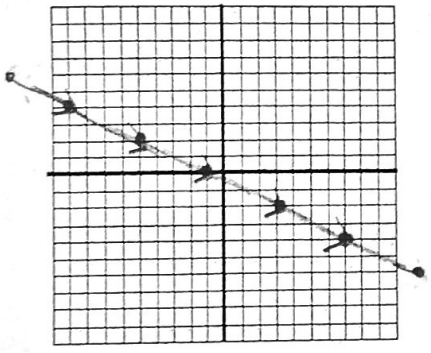
$y = \frac{1}{\frac{1}{2}} = 2$

$(3.5, 2)$

For each below, fill in the table, then graph the parametric equations:

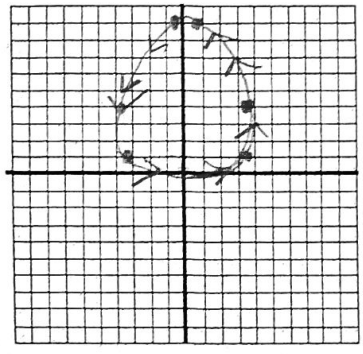
5.) $x(t) = 4t - 1$ $y(t) = -2t$

t	x	y
-3	-13	6
-2	-9	4
-1	-5	2
0	-1	0
1	3	-2
2	7	-4
3	11	-6



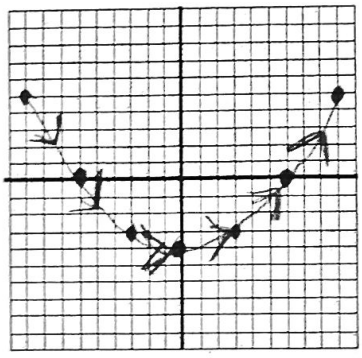
7.) $x(t) = 4\sin(t)$ $y(t) = t^2$

t	x	y
-3	.56	9
-2	-3.6	4
-1	-3.4	1
0	0	0
1	3.4	1
2	3.6	4
3	.56	9



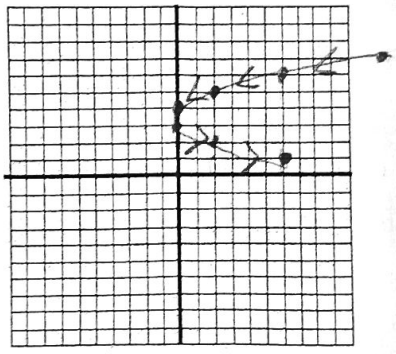
6.) $x(t) = 3t$ $y(t) = t^2 - 4$

t	x	y
-3	-9	5
-2	-6	0
-1	-3	-3
0	0	-4
1	3	-3
2	6	0
3	9	5



8.) $x(t) = t^2 - t$ $y(t) = 4 - t$

t	x	y
-3	12	7
-2	6	6
-1	2	5
0	0	4
1	0	3
2	2	2
3	6	1



Eliminating the Parameter

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Eliminate the parameter in each set of equations. Your final answer should be fully simplified and in rectangular form (all x's and y's, no t's).

Remember that you will occasionally need to use $\boldsymbol{\sin^2(x) + \cos^2(x) = 1}$

1.) $x(t) = 5 + t$ $\quad x - 5 = t$
$y(t) = 3t + 1$

$y = 3(x-5)+1$

$y = 3x - 15 + 1$

$\boxed{y = 3x - 14}$ Line
Slope = 3 y-int (0, -14)

2.) $x(t) = 6t - 1$ $\quad \frac{x+1}{6} = t$
$y(t) = 2t + 11$

$y = 2\left(\frac{x+1}{6}\right) + 11$

$\boxed{y = \frac{1}{3}(x+1) + 11}$ or $\boxed{x - 3y = 34}$ or

$y = \frac{1}{3}x + \frac{1}{3} + 11$

$\boxed{y = \frac{1}{3}x + \frac{34}{3}}$ line
slope $= \frac{1}{3}$ y-int $\left(0, \frac{34}{3}\right)$

3.) $x(t) = \frac{3}{t}$ $\quad t = \frac{3}{x}$
$y(t) = 6t + 1$

$y = 6\left(\frac{3}{x}\right) + 1$

$\boxed{y = \frac{18 + x}{x}}$ Rational

4.) $x(t) = \sqrt{t-7}$ $\quad t \geq 7$
$y(t) = t^2 + 9$

$x^2 + 7 = t$

or $y = (x^2+7)^2 + 9$

$y = x^4 + 14x^2 + 58$

Quartic

5.) $x(t) = 3\cos(t)$ $\quad \frac{x}{3} = \cos t$
$y(t) = 4\sin(t)$ $\quad \frac{y}{4} = \sin t$

$\boxed{\frac{x^2}{9} + \frac{y^2}{16} = 1}$

Ellipse

6.) $x(t) = 8 - t$ $\quad t = 8 - x$
$y(t) = t^2 + 10t - 100$

$y = (8-x)^2 + 10(8-x) - 100$

$y = x^2 - 16x + 64 + 80 - 10x - 100$

$\boxed{y = x^2 - 26x + 44}$

Parabola

7.) $x(t) = 10\cos(t)$ $\quad \frac{x}{10} = \cos t$
$y(t) = 5\sin(t)$ $\quad \frac{y}{5} = \sin t$

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

Ellipse

8.) $x(t) = \frac{1}{t}$ $\quad t = \frac{1}{x}$ $\quad t \neq 0$
$y(t) = \frac{4}{t}$

$y = \frac{4}{\frac{1}{x}}$

$\boxed{y = 4x}$ linear $x \neq 0$

9) $x(t) = 2 + 5\sec t$ $\quad \frac{x-2}{5} = \sec t$
$y(t) = 1 + 3\tan t$ $\quad \frac{y-1}{3} = \tan t$

$\sec^2 t - \tan^2 t = 1$

$\boxed{\frac{(x-2)^2}{25} - \frac{(y-1)^2}{9} = 1}$ hyperbola