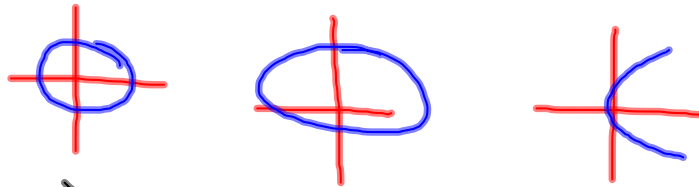


Section 10.1: Parametric Equations

Graphs that can't be modelled by functions (they don't pass the vertical line test) can be modelled by Parametrics

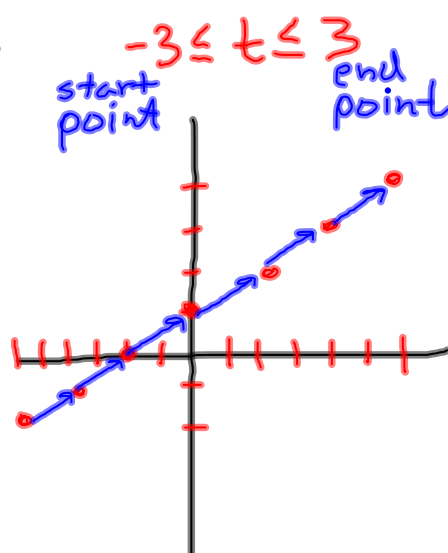


(x, y) where $x=f(t)$ $y=g(t)$

t is the parameter
on the interval $\underline{a} \leq t \leq \underline{b}$

$$\underline{x = 2t} \quad \underline{y = t + 1}$$

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



Converting Parametric Equations to Rectangular

- 1) solve $x(t)$ for t
- 2) substitute x in for t in $y(t)$

$$x = \frac{1}{2}t$$

$$\frac{x}{\frac{1}{2}} = t$$

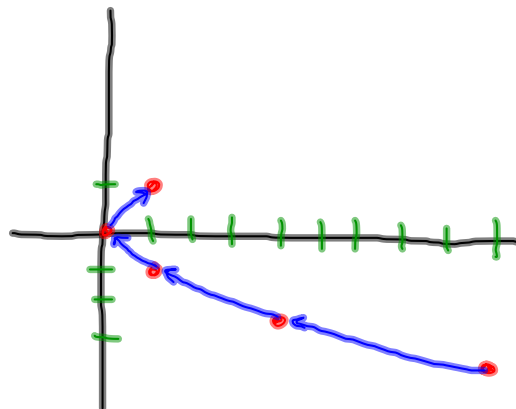
$$y = t + 1$$

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

$$y = \frac{1}{2}x + 1 \leftarrow y = \frac{x}{\frac{1}{2}} + 1$$

$$x = t^2 - 2t + 1 \quad y = t - 1 \quad -2 \leq t \leq 2$$

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



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

$$\sqrt{x} = \sqrt{(t-1)^2}$$

$$\sqrt{x} = t - 1$$

$$\sqrt{x} + 1 = t$$

$$y = t - 1$$

$$y = (\sqrt{x} + 1) - 1$$

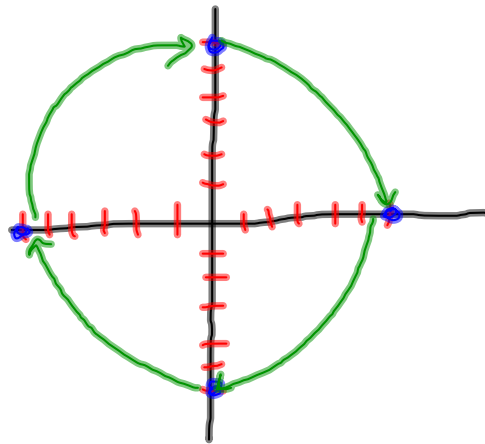
$$y = \sqrt{x}$$

$$\underline{x = 6 \sin t}$$

$$y = 6 \cos t$$

$$0 \leq t \leq 2\pi$$

t	x	y
0	0	6
$\pi/2$	6	0
π	0	-6
$3\pi/2$	-6	0
2π	0	6



$$x = 6 \sin t \quad y = 6 \cos t$$

$$\begin{aligned} x^2 + y^2 &= (6 \sin t)^2 + (6 \cos t)^2 \\ &= 36 \sin^2 t + 36 \cos^2 t \\ &= 36 (\sin^2 t + \cos^2 t) \end{aligned}$$

$$x^2 + y^2 = 36$$

circle with $r = 6$

$$x^2 + y^2 = r^2$$

equation of a circle
with
radius = r