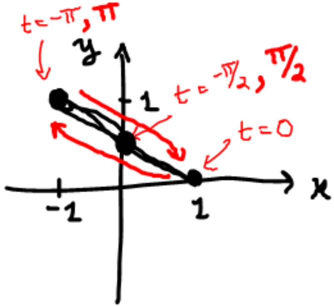
$\sin(\pi/4) = \frac{\sqrt{2}}{2}$

E.g. Suppose that the path of a certain particle is given by the parametric equation

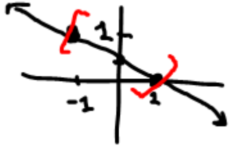
$$\begin{cases} x(t) = \cos(t) \\ y(t) = \sin^2(\frac{t}{2}) \end{cases} \quad -\infty < t < \infty$$

(1) Sketch this curve, using an arrow to indicate direction.

t	$x(t) = \cos(t)$	$y(t) = (\sin(t/2))^2$
$-\pi$	$\cos(-\pi) = -1$	$(\sin(\frac{-\pi}{2}))^2 = (-1)^2 = 1$
$-\pi/2$	$\cos(-\pi/2) = 0$	$(\sin(\frac{-\pi}{4}))^2 = (-\frac{\sqrt{2}}{2})^2 = \frac{2}{4} = \frac{1}{2}$
0	$\cos(0) = 1$	$(\sin(\frac{0}{2}))^2 = (\sin 0)^2 = 0^2 = 0$
$\pi/2$	$\ldots = 0$	$\ldots = 1/2$
π	$\ldots = -1$	$\ldots = 1$



(2) Eliminate the parameter to find a cartesian equation



$x(t) = \cos(t)$ ← Range of $\cos(t)$ is $[-1, 1]$

$y(t) = \sin^2\left(\frac{t}{2}\right)$

want eqn of just x & y

must have an equation relating x & y

Remember: $\sin^2\theta = \frac{1-\cos(2\theta)}{2}$

plug in $\theta = \frac{t}{2}$, $2\theta = 2\cdot\frac{t}{2} = t$

$$y(t) = \boxed{\sin^2\left(\frac{t}{2}\right)} = \frac{1-\boxed{\cos(t)}}{2}$$ $x(t)$

Cartesian eqn

$$y = \frac{1-x}{2} = -\frac{1}{2}x + \frac{1}{2}$$ ← Restricted to x in $[-1,1]$