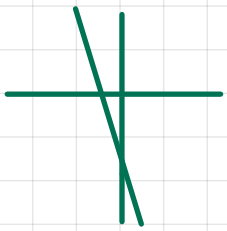
1 $x = t + 1 \quad y = 2t - 1$

$t = x - 1 \Rightarrow y = 2(x-1) - 1 = 2x - 2 - 1 = 2x - 3$



5 $x = t + 1 \quad y = 2t^2 - t - 1$

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

$= 2x^2 - 4x + 2 - x + 1 - 1$

$= 2x^2 - 5x + 2$

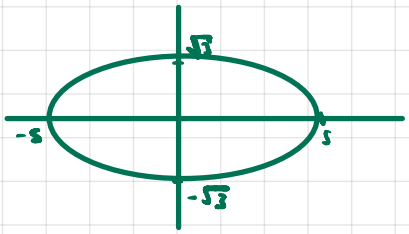
9 $x = 5\cos t \quad y = 3\sin t$

$x^2 = 25\cos^2 t \quad y^2 = 3(1 - \cos^2 t)$

$\cos^2 t = \frac{x^2}{25} \quad = 3(1 - x^2/25) \Rightarrow y^2 = 3 - \frac{3}{25}x^2 \Rightarrow y = \pm\sqrt{3 - \frac{3}{25}x^2}$

$y^2 + \frac{3}{25}x^2 = 3$

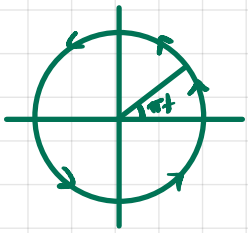
ellipsis



15 $x = \sin^2 \pi t \quad 0 \le t \le 2$

$y = \cos^2 \pi t$

$x + y = \sin^2 \pi t + \cos^2 \pi t = 1$

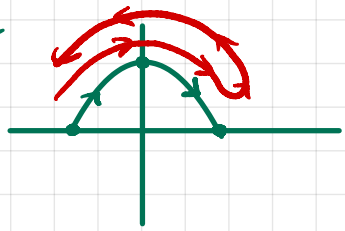


16 $x = \cos t \quad y = \sin^2 t \quad -\pi < t < \pi$

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

$y' = -2x$

$y'' = -2$



t	x	y
$-\pi$	-1	0
$-\pi/2$	0	1
0	1	0
$\pi/2$	0	1
π	-1	0

18 $x = \cos^3 t \quad y = \sin^3 t \quad t = \pi/4$

$\frac{dx}{dt} = 3\cos^2 t(-\sin t) \quad \frac{dy}{dt} = 3\sin^2 t \cos t$

$\frac{dy}{dx} = \frac{y'}{x'} = \frac{3\cos^2 t \sin t}{3\sin^2 t \cos t} = \frac{-\cos t}{\sin t}$

$\frac{dy}{dx}(\pi/4) \cdot \frac{-\cos \pi/4}{\sin \pi/4} = -1$

$x(\pi/4) = \left(\frac{\sqrt{2}}{2}\right)^3 = y(\pi/4) = 2^{3/2 - 3} \cdot 2^{-\frac{3}{2}}$

$y - 2^{-3/2} = -(x - 2^{-3/2})$

$\Rightarrow y = -x + 2^{-3/2} + 2^{-3/2} = -x + 2^{-\frac{1}{2}}$

$\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt} \Rightarrow \frac{dy}{dx} = \frac{dy/dt}{dx/dt}$

$\frac{d^2y}{dt^2} = \frac{d}{dx}(dy/dt) \cdot \frac{dx}{dt}$

20 $x = e^t \quad y = e^{-t} \quad t = 0$

$x'(t) = e^t$
$y'(t) = -e^{-t}$

$\left(\frac{dy}{dx}\right)(t) = \frac{-e^{-t}}{e^t} = \frac{-1}{e^{2t}}$, $\left(\frac{dy}{dx}\right)(0) = -1$

$x(0) = 1$
$y(0) = 1$ $\Rightarrow$ $y - 1 = -1(x - 1)$ $\Rightarrow$ $y = -x + 2$
$y - 1 = -x + 1$

$y''(t) = e^{-t}$