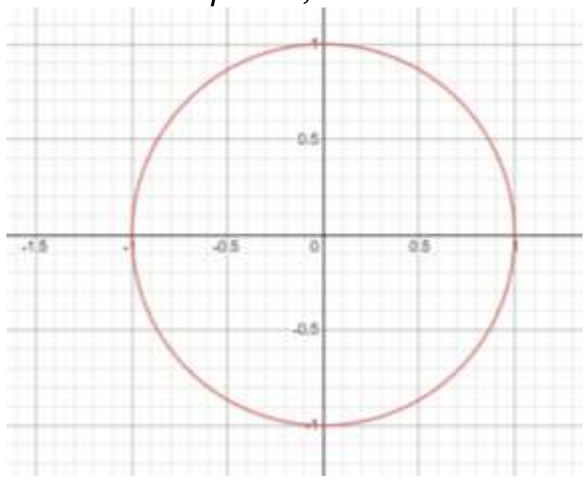
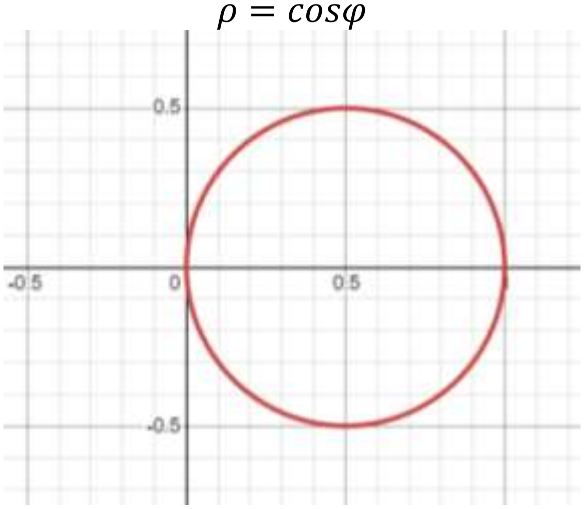
1. Circles in polar coordinates:

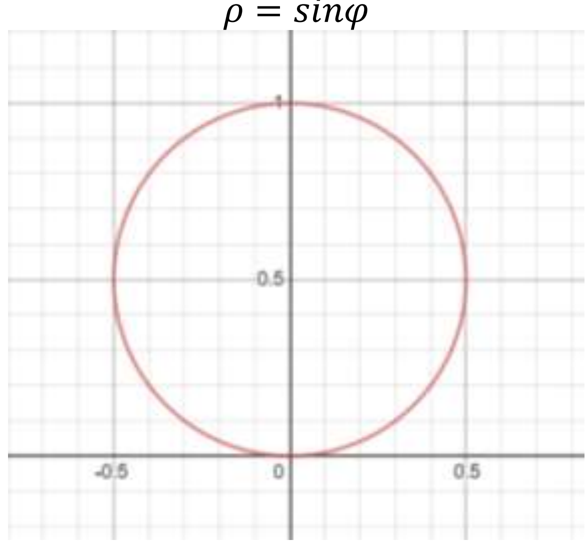
$\rho = a$, a=1



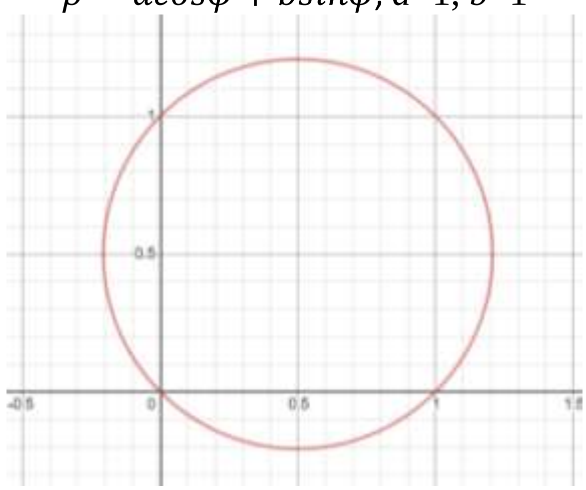
$\rho = cos\varphi$



$\rho = sin\varphi$



$\rho = acos\varphi + bsin\varphi$, a=1, b=1

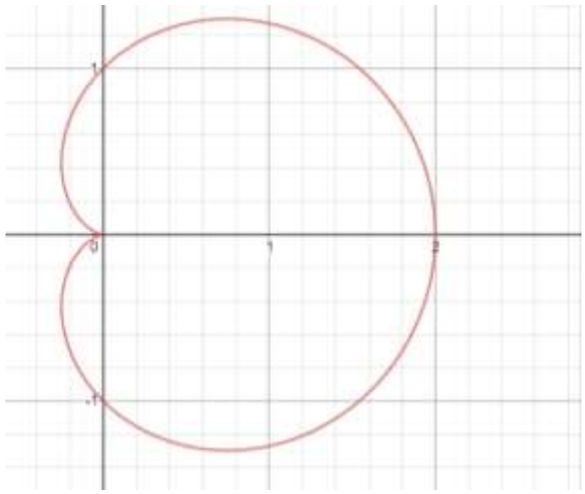


2 Cardioid

$$\rho = a(1 + \cos\varphi),\ a > 0$$

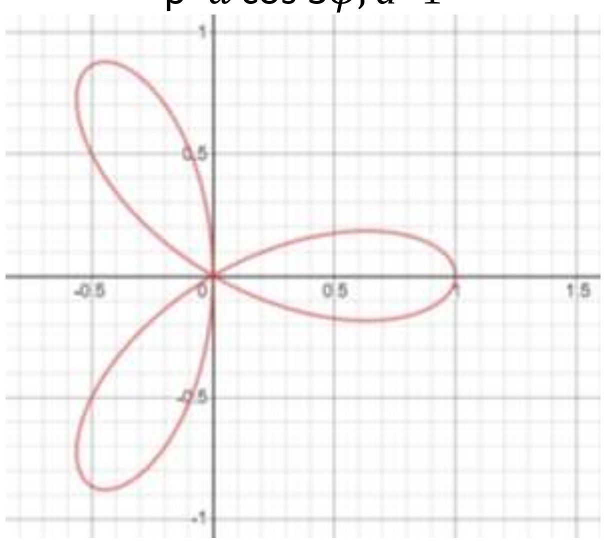
Also, $\rho = a(1 - \cos\varphi)$, $\rho = a(1 + \sin\varphi)$, $\rho = a(1 - \sin\varphi)$

$$\rho = (1 + \cos\varphi)$$



3 *k*-petaled roses: $\rho = a\cos k\varphi$, $\rho = a\sin k\varphi$, $a > 0$

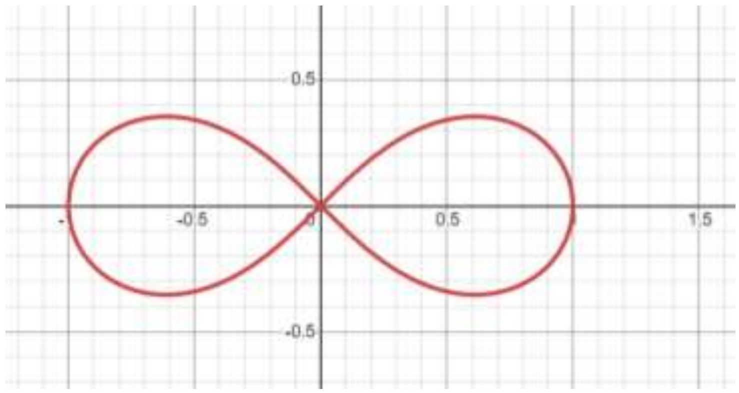
ρ=a cos 3φ, a=1



4. Lemniscate of Bernoulli

$$\rho = a\sqrt{\cos 2\varphi},\ a > 0$$

$\rho = \sqrt{\cos 2\varphi}$, a=1



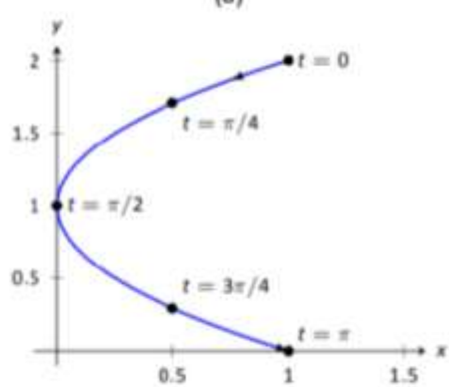
Lines in Parametric Form

Let f and g be continuous functions on an interval I. The set of all points $(x, y) = (f(t), g(t))$ in the Cartesian plane, as t varies over I , is the graph of the parametric equations $x = f(t)$ and $y = g(t)$, where t is the parameter. A curve is a graph along with the parametric equations that define it.

Example: Plotting parametric functions $x = \cos^2 t$, $y = \cos t + 1$, for t in $[0, \pi]$. Sketch the graph of the parametric equations

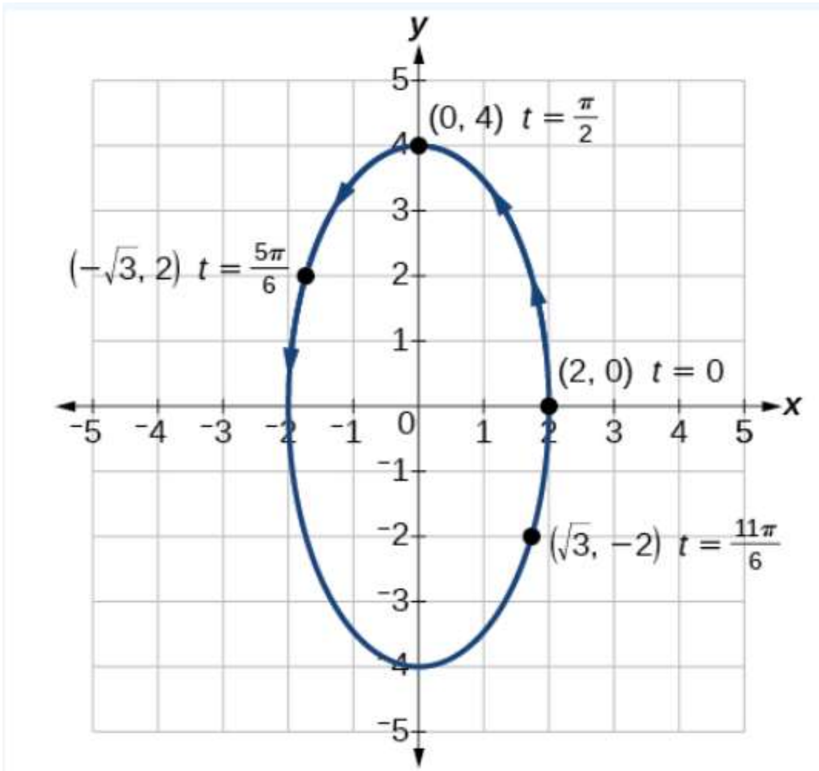
t	x	y
0	1	2
$\pi/4$	1/2	$1 + \sqrt{2}/2$
$\pi/2$	0	1
$3\pi/4$	1/2	$1 - \sqrt{2}/2$
π	1	0

(a)



5 Ellipse

$x = 2\cos(t),$
$y = 4\sin(t).\ 0 \leq t \leq 2\pi$

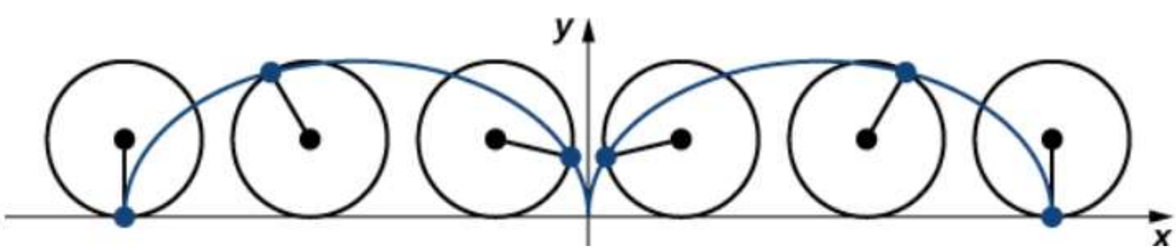


6 Cycloid

A cycloid generated by a circle (or bicycle wheel) of radius a is given by the parametric equations

$x = a(t - \sin(t)),$
$y = a(1 - \cos(t)),\ 0 \leq t \leq 2\pi$

A wheel traveling along a road without slipping; the point on the edge of the wheel traces out a cycloid.



7 Astroid

In this graph, the green circle is traveling around the blue circle in a counterclockwise direction. A point on the edge of the green circle traces out the red graph

$x = 4\,cos^3(t)$,

$y = 4\,sin^3(t)$, $0 \le t \le 2\pi$