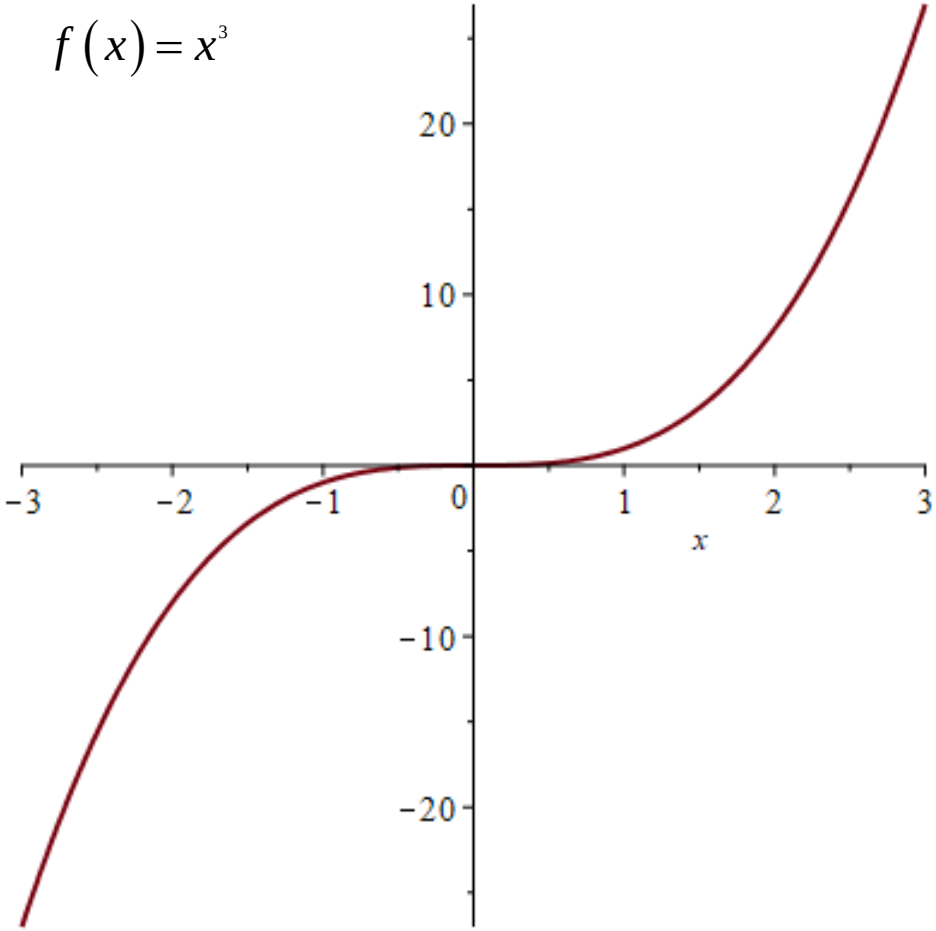
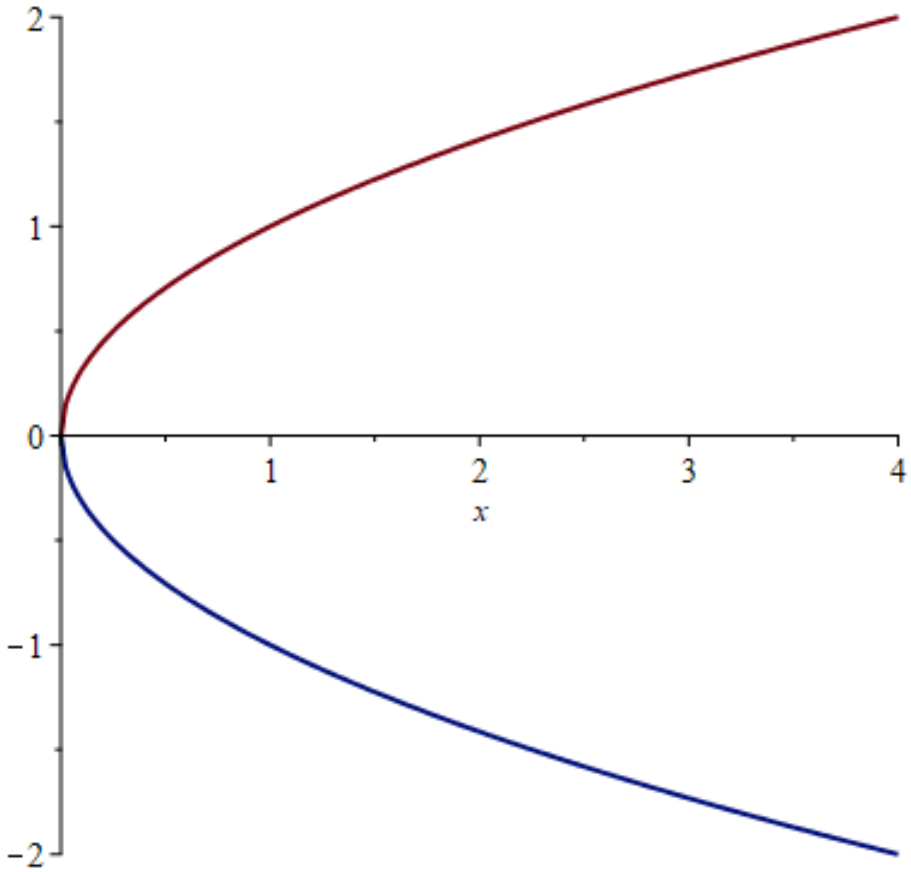
Review of Representing curves in the plane:

Graph of a function of *x*:



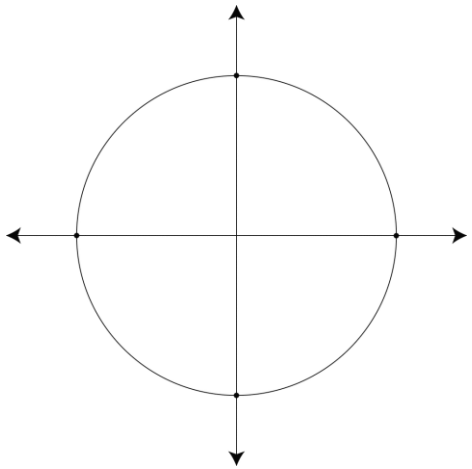
Graph of a function of *y*:

$$g(y) = y^2$$

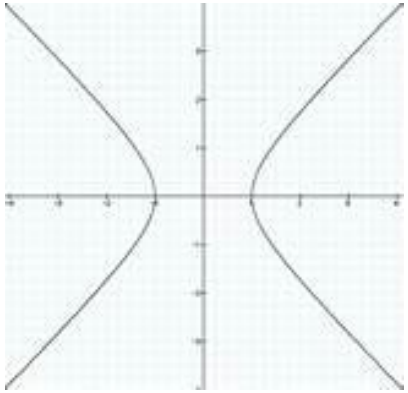


Graph of the solutions of an equation in *x* and *y*:

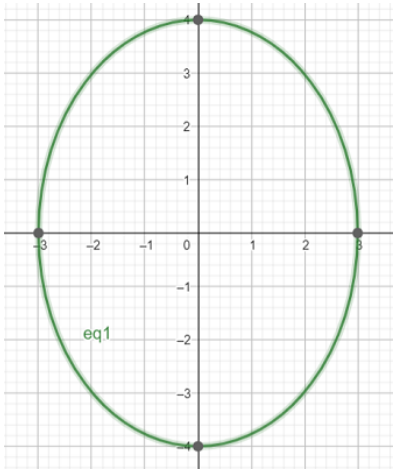
$x^2 + y^2 = 1$

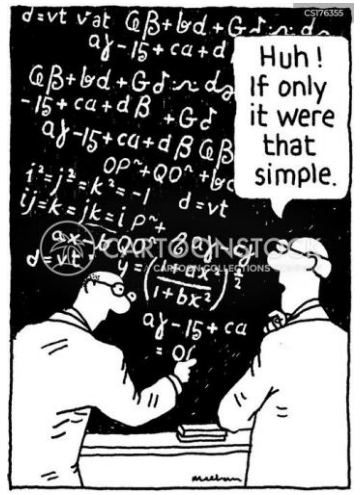


$x^2 - y^2 = 1$



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





Parametric Equations:

$$\begin{cases} x = f(t) \\ \\ y = g(t) \end{cases} \quad ;\ t \text{ is restricted to some interval}$$

***t* is called the parameter.**

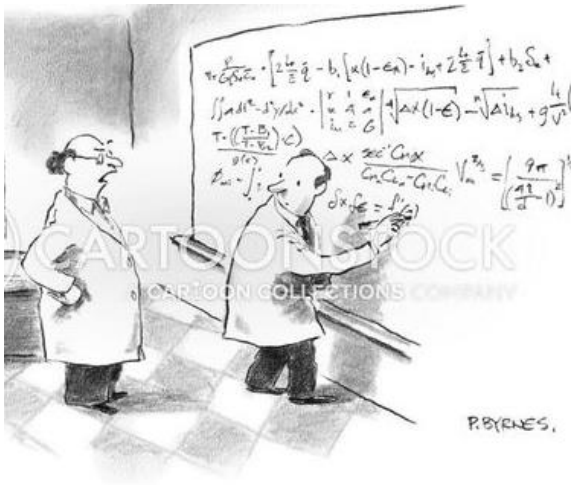
Examples:

1. $\begin{cases} x = t + 1 \\ \\ y = 2t - 3 \end{cases} \quad ; 0 \le t \le 2$

t	*x*	*y*
0	**1**	**-3**
.5		
1		
1.5		
2		

Eliminate the parameter.

2. $\begin{cases} x = -t + 3 \\ \\ y = 3t + 1 \end{cases} ; 1 \le t \le 4$



"Duh!"

3. $\begin{cases} x = 2t - 1 \\ \\ y = t^2 \end{cases} ; -1 \le t \le 4$

4. $\begin{cases} x = \cos t \\ \\ y = \sin t \end{cases} ;0 \le t \le \pi, \quad \sin^2\theta + \cos^2\theta = 1$

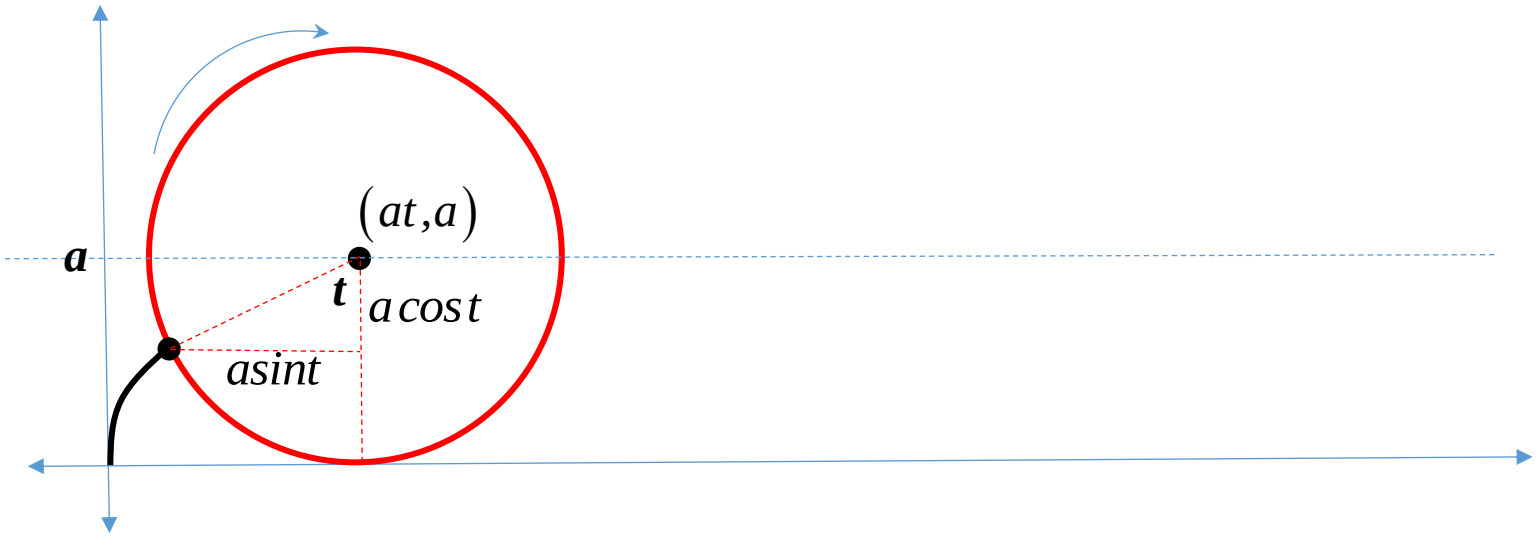
5. $\begin{cases} x = 2\cos t \\ \\ y = 3\sin t \end{cases} ;0 \le t < 2\pi, \quad \sin^2\theta + \cos^2\theta = 1$

6. $\begin{cases} x = \cos t - 1 \\ \qquad\qquad ;0 \le t < 2\pi \\ y = \sin t + 2 \end{cases}$, $\sin^2\theta + \cos^2\theta = 1$

7. $\begin{cases} x = \sec t \\ \qquad\qquad ;0 \le t < \dfrac{\pi}{2} \\ y = \tan t \end{cases}$, $\sec^2\theta - \tan^2\theta = 1$

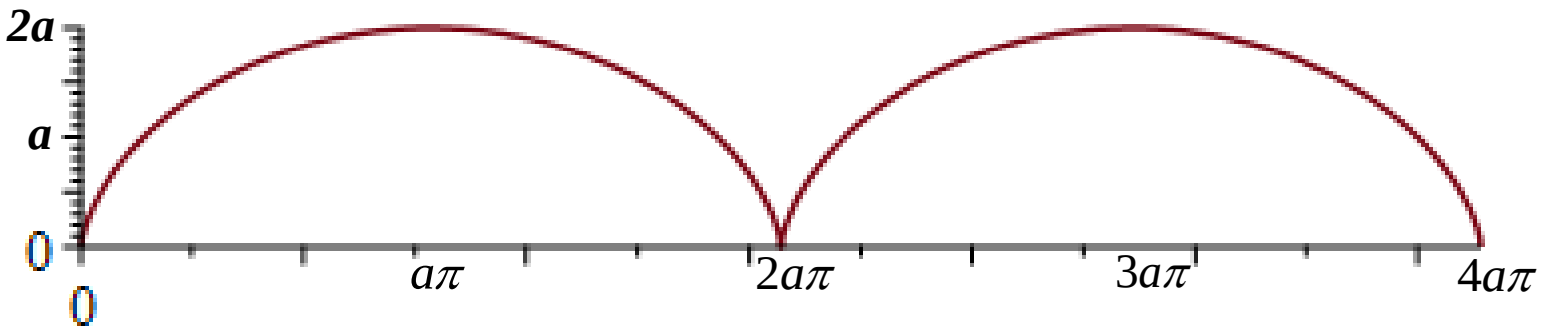
The Cycloid:

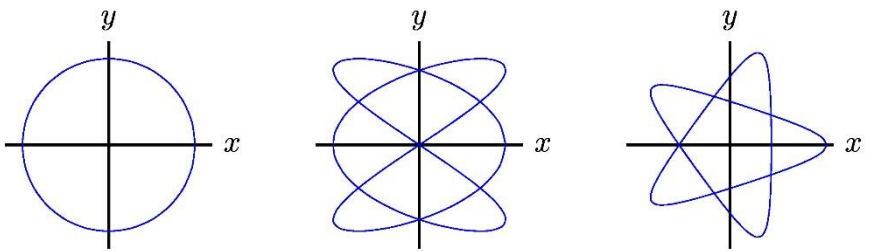
The Cycloid is the curve traced out by a fixed point on a circle of radius *a* that is rolling along the *x*-axis, starting at the origin.



So the parametric equations are

$$\begin{cases} x = at - a\sin t \\ \\ y = a - a\cos t \end{cases} ;t \geq 0.$$





$x(t) = \cos(t)$
$y(t) = \sin(t)$

$x(t) = 3\cos(t)$
$y(t) = 2\sin(t)$

$x(t) = 2\cos(x) + 5\cos(\frac{2}{3}x)$
$y(t) = 2\sin(x) + 5\sin(\frac{2}{3}x)$