AP Calculus AB
2.9 – Implicit Differentiation

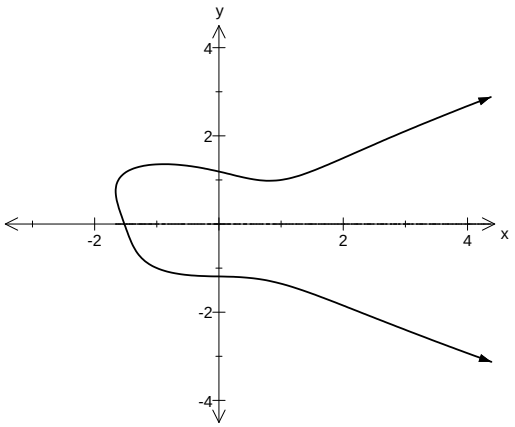
The equations of the graphs of some "functions" are often written **implicitly**, i.e. it is **implied** that *y* is some function of *x*, but we are not **explicitly** given what *y* is in terms of *x*.

E.g. $y = 3x^3 + x^2 - 5$ Explicit definition, because we are given "$y = \ldots$"

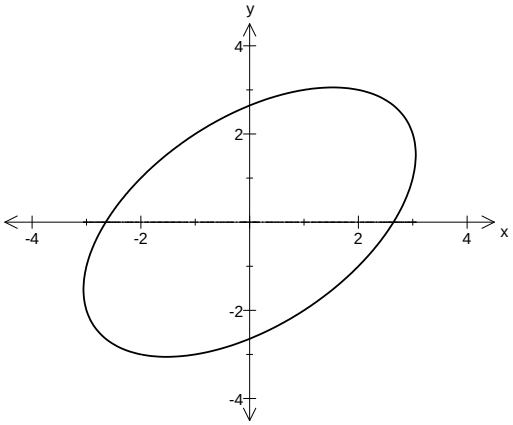
$x^2 + y^2 = 1$ Implicit definition, because we not explicitly given "$y = \ldots$"

Some examples of implicitly defined functions and their graphs:

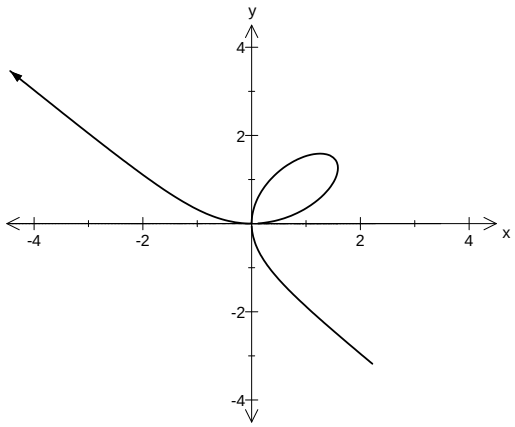
$y^4 + xy = x^3 - x + 2$



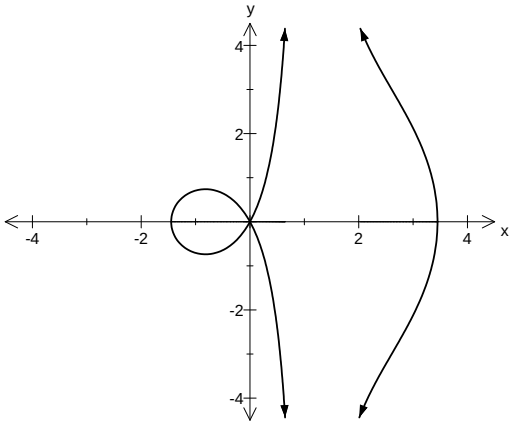
$x^2 - xy + y^2 = 7$



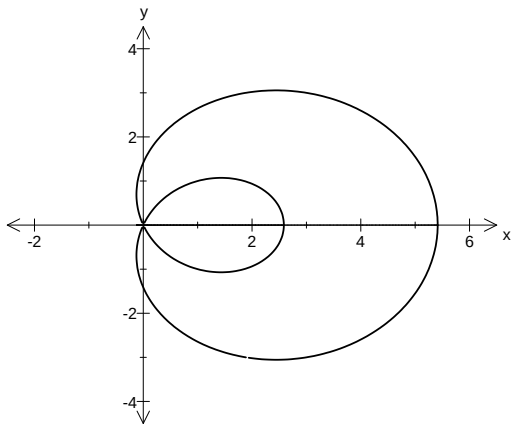
Folium of Descartes: $x^3 + y^3 = 3xy$



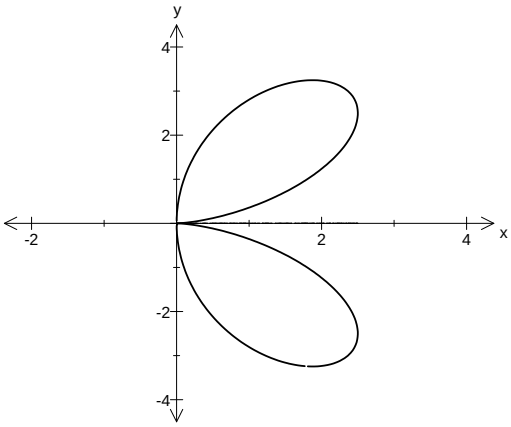
Conchoid: $(x-1)^2(x^2 + y^2) = 6x^2$



Limaçon of Pascal: $\left(x^2+y^2-4x\right)^2=2\left(x^2+y^2\right)$



Double Folium: $\left(x^2+y^2\right)^2=\frac{25}{4}xy^2$



Lemniscate Curve: $\left(x^2+y^2\right)^2=4\left(x^2-y^2\right)$