

## Pre-Med Calculus

### 2.8 – Implicit Differentiation

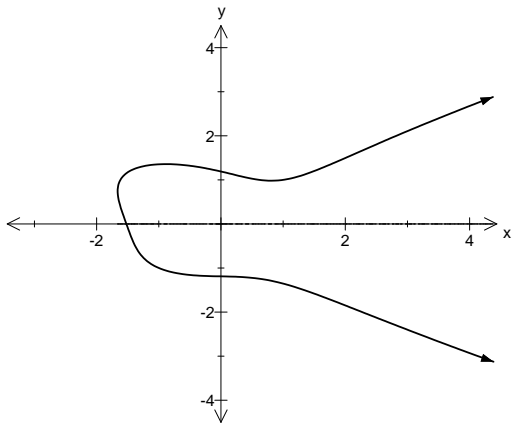
The equations of the graphs of some "functions" are often written **implicitly**, i.e. it is **implied** that  $y$  is some function of  $x$ , but we are not **explicitly** given what  $y$  is in terms of  $x$ .

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

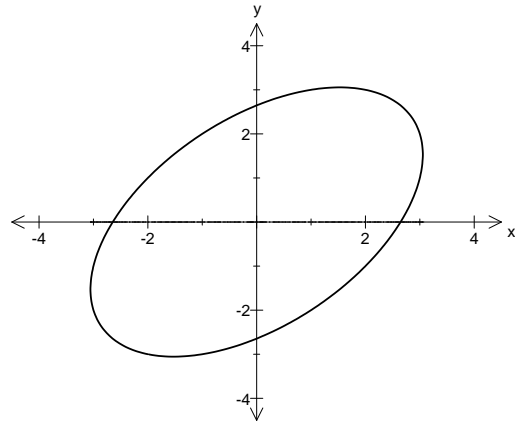
$x^2 + y^2 = 1$       Implicit definition, because we not explicitly given “ $y = \dots$ ”

Some examples of implicitly defined functions and their graphs:

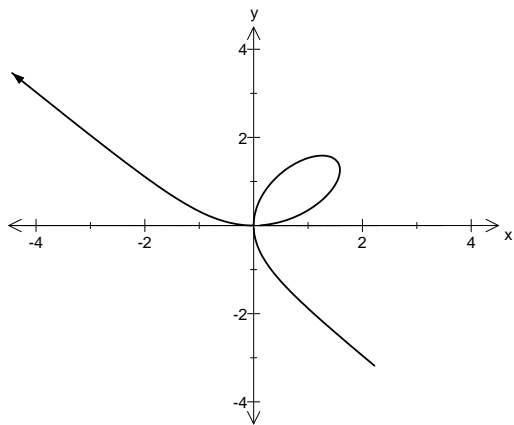
$$y^4 + xy = x^3 - x + 2$$



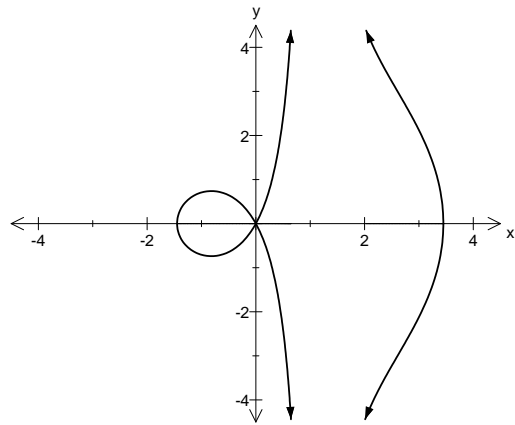
$$x^2 - xy + y^2 = 7$$



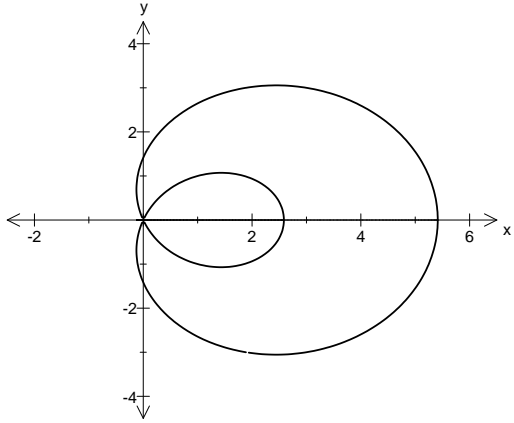
**Folium of Descartes:**  $x^3 + y^3 = 3xy$



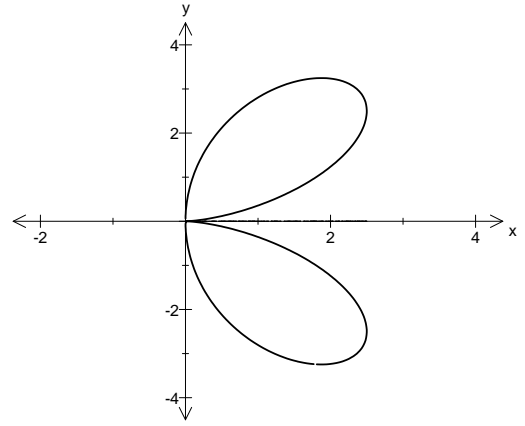
**Conchoid:**  $(x-1)^2(x^2 + y^2) = 6x^2$



**Limaçon of Pascal:**  $(x^2 + y^2 - 4x)^2 = 2(x^2 + y^2)$



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



**Lemniscate Curve:**  $(x^2 + y^2)^2 = 4(x^2 - y^2)$

