IMPLICIT DIFFERENTIATION

Math 1110
March 10, 2017

(1) In your own words, what is implicit differentiation and why is it useful?

(2) Consider the equation of a circle of radius one: $x^2 + y^2 = 1$.

(a) Draw a picture of this circle.

(b) What would you guess the slope of the tangent line is to the circle at $x = \frac{1}{2}$. Why do you say this?

(c) Check your work by first finding a formula for $\frac{dy}{dx}$ and then finding the slope of the tangent line at $x = \frac{1}{2}$. Does your answer make sense with your picture? Why or why not?

(3) Use implicit differentiation to find $\frac{dy}{dx}$:

(a) $-y^2 = 1$

(b) $\sqrt{x} - \sqrt{y} = 1$

(c) $2x^2y + 3xy^3 = 1$

(d) $(x-1)y^2 = x+1$

(4) For each of the problems in the previous part, find the second derivative with respect to x. What is different or notable about this process?

(a) $-y^2 = 1$

(b) $\sqrt{x} - \sqrt{y} = 1$

(c) $2x^2y + 3xy^3 = 1$

(d) $(x-1)y^2 = x+1$

(5) Find the slope of the tangent line to the given curve at the given point.

(a) $xy^5 + yx^5 = 1$ at $(-1, 1)$

(b) $\frac{1}{x^3} + \frac{1}{y^3} = 2$ at $(1, 1)$