Math 199, Fall 2023
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Participation assignment 6 - Implicit differentiation

Estimated time: 45-50 minutes.

Point value: 3 points.

Goals: Practice computing derivatives of functions that you don't have an explicit formula for.

1) Compute $\dfrac{dy}{dt}$ given $y^2 t^3 = \sin(y^2) + t^5$.

2) Compute $\dfrac{d^2 y}{dx^2}$ given $x^2 - y^2 = 1$.

3) Consider the curve defined by $x^3 + y^3 = xy^2 + 5$.

(a) Find the equation for the tangent line to the curve at the point (1,2).

(b) At which points on the curve is the tangent line horizontal? At which points is the tangent line vertical?

One tool for doing implicit differentiation is to take a logarithm of both side of the equation first, and then unwind your final answer given that you've done this. Keep this in mind for the following problems.

4) Compute $\dfrac{dy}{dx}$ given $x^y = y^x$.

5) Calculate the derivatives of the following functions.

(a) $f(x) = (x^2 + 5)^{x^3}$.

(b) $g(t) = \sin(t)^{\sin(t)}$.

(c) $h(x) = x^{\ln x}$