

**MTH 251**  
**LAB §3.5**

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1. What is the difference between explicit differentiation and implicit differentiation?
2. Under what conditions should we use implicit differentiation?
3. The formula  $25 = x^2 + y^2$  represents a circle centered at the origin of radius 5. Find a formula for  $\frac{dy}{dx}$ , using proper notation. Graph the equation on Desmos.
4. The graph of  $3y^2 = (x - \frac{1}{2})^3$  is called a semicubical parabola. Find a formula for  $\frac{dy}{dx}$ , using proper notation. Graph the equation on Desmos.
5. The equation  $81x^2 - 16y^2 - 162x - 64y = 1279$  has a graph of a hyperbola centered at  $(1, -2)$ . Find a formula for  $\frac{dy}{dx}$ , using proper notation. Graph the equation on Desmos.
6. The equation  $y^2(y^2 - 4) = x^2(x^2 - 5)$  has a graph known as a devil's curve. Find the equation of the line tangent to this curve at the point  $(0, -2)$ , using proper notation. Graph the equation on Desmos.
7. Below is the graph of the ellipse whose equation is  $x^2 + 4y^2 = 16$  along with two different tangent lines.
  - a. Find the equation of the line tangent to the ellipse at the point  $(-2, -\sqrt{3})$ .
  - b. Find the equation of the line tangent to the ellipse at the point  $(-2, \sqrt{3})$ .
  - c. Find out where the two tangent lines above intersect.

