

# Differentiation galore!

Math 1A, section 103

March 4, 2014

0. (Warmup.) Find the derivative of the function  $f(x) = 1/x$ .
  
1. Use derivative rules to compute the derivatives of the following functions with respect to  $x$ :
  - (a)  $f(x) = \frac{e^x}{1+x}$
  
  - (b)  $f(x) = e^{e^x}$
  
  - (c)  $f(x) = \arcsin(3x)$
  
  - (d)  $f(x) = \ln(1 - x)$
  
  - (e)  $f(x) = 2^x + 3^x$
  
  - (f)  $f(x) = \cos(\arcsin(x))$

2. Compute the derivative of  $(\sin(x))^3$  by using the chain rule and by using the product rule. Do you get the same answer in either case?
  
3. Use implicit differentiation to find the tangent line to the circle  $x^2 + y^2 = 25$  at the point  $(3, -4)$ . What happens when you try to solve for  $y$  and find the derivative instead of using implicit differentiation?
  
4. Use implicit differentiation to find the slope of the tangent line to a point  $(a, b)$  that lies on the circle  $x^2 + y^2 = 1$ . Express your answer in terms of  $a$  and  $b$ .
  
5. Sketch the graph of the function  $f(x) = x^3 - 2x$ . Find  $f''(-1)$ ,  $f''(0)$ , and  $f''(2)$ . What do you think the second derivative might tell us about the graph?
  
6. *Create your own problem!* Write a calculus problem for your partner. It can be on derivatives, limits, or anything else we've covered in class so far. When you and your partner are done, exchange problems and try to solve each other's problem.