Objectives:

1. To become familiar with the various Rules of Differentiation

2. Learn more features of `Derive`

Introduction

This lab will consist of a number of worksheets which you will need to complete which will give you practice with the particular rules of differentiation that we have been learning. As you are filling out the Tables, think about what rules you are applying to get your answer. Let's begin by **you** filling in the list of rules below:

Addition and Subtraction Rule

$$[f(x) + g(x)]' = \underline{\hspace{4cm}}$$
$$[f(x) - g(x)]' = \underline{\hspace{4cm}}$$

Constant Multiple Rule

$$[cf(x)]' = \underline{\hspace{4cm}}$$

Power Rule

$$[x^p]' = \underline{\hspace{4cm}}$$

Product Rule

$$[f(x) \cdot g(x)]' = \underline{\hspace{4cm}}$$

Quotient Rule

$$\left[\frac{f(x)}{g(x)}\right]' = \underline{\hspace{4cm}}$$

Reciprocal Rule

$$\left[\frac{1}{g(x)}\right]' = \underline{\hspace{4cm}}$$

Chain Rule

$$[f(g(x))]' = \underline{\hspace{4cm}}$$

The Hardest Derivative

$$\left[f(x)^{g(x)}\right]' = \underline{\hspace{4cm}}$$

§1. Table A

$f(x)$	$f'(x)$	$f''(x)$
$3x$		
	x^2	
$2 + \ln(x)$		
	$\frac{1}{2}e^x$	
$-3\sin(x)$		
$\cos(x)$		
	$\dfrac{5}{x^3}$	
	$4 + 1/x$	
	$(\ln \pi)\pi^x$	
$5\sqrt{x} + 7$		

§2. Table B

$f(x)$	$f'(x)$
$3x \cdot e^x$	
$\dfrac{2}{\ln(x)}$	
$3x \cdot 3^x$	
$3x \cdot x^3$	
$\dfrac{\cos(x)}{\sin(x)}$	
$\cos(x) \cdot \sin(x)$	
$\cos(x) \cdot \cos(x)$	
$\dfrac{\sqrt{x}}{x^4}$	
$\sqrt{x} \cdot x^4$	
$x^2 \cdot \ln(x) \cdot 2^x$	

§3. Table C

f	f'
$x^3 + 5$	
$(x^3 + 5)^2$	
$(u(x))^2$	
$(e^{-x}\tan(x))^2$	
$\ln(\cos(x))$	
$\ln(g(x))$	
$\ln(\tan^2(x)\sqrt{x^3 + 5})$	

Using Derive to Check Your Work
You can check any of these Derivatives (and your homework!) by **Author**ing the expression in `Derive`. Simply select **Calculus** from the top menu and then **Differentiate**. It will ask you what variable do you want to differentiate with respect to, and to what order (how many times do you want to differentiate it at once). Press **Simplify** and `Derive` provides you with the derivative.

An interesting discussion question (for the web bulletin board) would be to contemplate whether you should be learning how to differentiate functions if there is a computer program (`Derive`) which can do it for you. **Post your thoughts!**
Write-Up
Due Thursday November 15. Hand in one clean copy of this completed worksheet per lab group, with a Grade Allocation Cover Sheet.