

# Math 2315 - Calculus II

## Homework #1

Assigned - 2010.01.19

Due - 2010.01.25

Name: \_\_\_\_\_

---

Textbook problems:

Section 6.1 - 11-20 all, 21, 26, 27, 29, 30, 31, 34, 35, 36, 37, 43, 44, 53

---

Fun Problems:

1. Show that if  $f(x)$  and  $g(x)$  are differentiable, then

$$\frac{d}{dx} \ln(f(x)g(x)) = \frac{f'(x)}{f(x)} + \frac{g'(x)}{g(x)}.$$

2. Since the left hand side of the equation above is symbolically given by:

$$\frac{d}{dx} \ln(f(x)g(x)) = \frac{\frac{d}{dx}(f(x)g(x))}{f(x)g(x)},$$

set the right hand sides of both equations equal to derive a new proof of the product rule  $\frac{d}{dx}(f(x)g(x))$ .

3. Define  $F(x)$  to be the following product:

$$F(x) = \frac{\prod_{i=1}^n f_i(x)}{\prod_{j=1}^m g_j(x)}.$$

By taking the derivative of  $\ln(F(x))$ , using the properties of the logarithm, show that

$$F'(x) = F(x) \left[ \sum_{i=1}^n \frac{f'_i(x)}{f_i(x)} - \sum_{j=1}^m \frac{g'_j(x)}{g_j(x)} \right].$$

4. Use the result of problem 3 to compute the derivative of the following function:

$$F(x) = \frac{(3x-2)(6x+4x^3-2)}{(5x-3)(4x^2-5)(7x^3+3x-1)}$$