Math 1314 The Product and Quotient Rules

In this lesson, we continue with more rules for finding derivatives. These are a bit more complicated.

## **Rule 7: The Product Rule**

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$$

Example 1: Use the product rule to find the derivative if  $f(x) = (5x^3 - 3)(x^2 + 6)$ .

Example 2: Find the derivative if  $f(x) = x^3 e^x$ .

Example 3: Find the derivative if  $f(x) = x \ln x$ .

## **Rule 8: The Quotient Rule**

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{\left[g(x)\right]^2}, \ g(x) \neq 0$$

It is easier for some students to remember this using this device:

$$\frac{d}{dx}\left[\frac{hi}{lo}\right] = \frac{lo\ de\ hi - hi\ de\ lo}{lo\ lo}$$

where "*de hi*" refers to the derivative of the numerator and "*de lo*" refers to the derivative of the denominator.

Example 4: Find the derivative if  $f(x) = \frac{7x-4}{5x+2}$ .

Example 5: Find the derivative if  $f(x) = \frac{x^2}{x+1}$ .

From this lesson, you should be able to State the product rule and the quotient rule Apply the product rule where appropriate Apply the quotient rule where appropriate