University of Lethbridge
Department of Mathematics and Computer Science

MATH 1560 - Tutorial #3

Monday, January 29

Some additional practice (copy these into your notes but do not submit anything):

1. Compute the derivatives of the following functions using the product rule:

   (a) $f(x) = x^2 \cos(x)$ (b) $g(x) = \sec(x)\tan(x)$ (c) $h(x) = \sqrt{x}(x^2 + 1)$

2. Compute the derivatives of the following functions using the quotient rule:

   (a) $f(x) = \dfrac{\sin(x)}{x^2 + 1}$ (b) $g(x) = \dfrac{x^3 - 2x^2 + 5x}{x^4 + e^x}$ (c) $h(x) = \dfrac{x^8 + \sqrt[3]{x}}{x^3}$

   Note: Problems 1(c) and 2(c) can be done without the product or quotient rule, respectively. Do you see how?

1. Let $f(x) = \dfrac{1}{\sqrt{x}}$. Compute $f'(1)$ **using the definition of the derivative**.
   (Note: in the definition, one can set $x = 1$ at the very beginning, or at the end. Which is going to be less work?)

2. Compute the derivative of $f(x) = 6\sqrt{x^3} - 7\sin(x) + 4e^x + \pi$.

3. Compute the derivative of $f(x) = x^3(x-1)^2$ by (a) using the product rule, and (b) first multiplying everything out. Confirm that your answers agree. Which method do you prefer? (What if you need to find where $f'(x) = 0$?)

4. Compute the derivative of $g(x) = \dfrac{x^7 - 3x^5 + 2x}{x^3}$ by
   (a) using the quotient rule, and (b) simplifying first. Which method do you prefer?

5. For the following functions, find all values of x such that $f'(x) = 0$:

   (a) $f(x) = x^5 - 15x^3$

   (b) $f(x) = x^{5/3} - 5x^{2/3}$

   (c) $f(x) = \dfrac{1 - x^2}{1 + x^2}$