Math 111, Section 01, Fall 2012

Worksheet 6, Thursday, October 11, 2012

1. Find **all** x-coordinates at which the graphs of the following functions have horizontal tangent lines. Please **simplify** your derivatives.

   (a) $f(x) = (x-3)^4(x+2)^6$

   (b) $f(x) = \dfrac{(x+1)^4}{(x+2)^5}$

2. Compute the following derivatives. Simplify your answers.

   (a) $f'(x)$, where $f(x) = \cos^4(x^3 - 5)$.

   (b) $g'(x)$, where $g(x) = \sqrt{x^{\frac{7}{9}} + (x^2+1)^{\frac{4}{3}}}$

   (c) $\dfrac{d}{dx}\,(x+1)^7 \cdot \sqrt{x+2}$ Simplify this answer to one single fraction.

3. Compute the derivative $\dfrac{dy}{dx}$ for each of the following equations.

   (a) $y^2 + \sec(x^2 y) = 1$.

   (b) $x^2y^4 + y^5 = x^3 + \dfrac{1}{y^2}$

   (c) $\tan\left(\dfrac{x}{y}\right) + \sqrt{x} = \sqrt{y}$

4. Compute the following derivatives. Do **not** simplify your answers here. Think carefully about which Differentiation Rule to use first... *Ready, Set, GO!*

   (a) $f'(x)$, where $f(x) = \dfrac{\sin x \cos^3 x}{\sqrt{\dfrac{3}{x} - \dfrac{4}{x^3}}}$.

   (b) $\dfrac{dy}{dx}$, where $y = \tan^4\left(\dfrac{4}{x} + \cos x\right)\sqrt{\dfrac{6}{x^6} + \sec(3x)}$.

   (c) $\dfrac{d}{dx}\,\sec\left(\dfrac{\dfrac{6}{x^6} + \tan(3x)}{\dfrac{4}{x} + \cos x}\right)$

Please turn over!

5. Let $f(x)$ and $g(x)$ be differentiable functions with the following table of values:

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	4	-3	2	7
2	-2	6	1	5
3	3	-2	-1	0

Let

$$h(x) = f(x) \cdot g(x)$$

$$k(x) = \frac{g(x)}{f(x)}$$

$$P(x) = f(x) \cdot f(x)$$

$$Q(x) = f \circ g(x)$$

$$W(x) = g \circ g(x).$$

Compute $h'(1)$, $k'(3)$, $P'(1)$, $Q'(2)$, and $W'(1)$.

Note: this problem is testing whether you know your differentiation rules, especially in the case when you don't know the actual function's ($f(x)$ or $g(x)$) formula. To compute the derivative at one specific x-value, you just need the derivative information of each function piece *at* that specific x-value. You don't need to know the entire function's formula. Think about which derivative values are required in each problem. Write out the derivative carefully, and then plug in your specific x-value.

Turn in your own solutions.