Math 111, Section 01, Fall 2014

Worksheet 5, Tuesday, October 7, 2014

1. Compute the derivative of each of the following functions. For these problems, you do **not** need to simplify your derivative.

   (a) $y = \dfrac{1}{\sqrt{x^2 - 5x + 3}}$

   (b) $y = \left(\dfrac{1}{x^3} + 7x\right)^{\frac{5}{7}} \left(x^4 - \dfrac{1}{x^7}\right)^{-5}$

   (c) $y = \sqrt{\dfrac{x^2 + 5}{5 - 3x}}$

   (d) $H(\theta) = \sec^2(\cos\theta)$

2. Compute each of the following derivatives. Simplify.

   (a) $f'\left(\sqrt{\dfrac{\pi}{3}}\right)$, where $f(x) = \dfrac{1}{\tan(x^2)}$. Be careful with all the squares.

   (b) $g''\left(\dfrac{\pi}{6}\right)$, where $g(x) = \dfrac{\cos x}{1 + \sin x}$. Hint: Simplify $g'(x)$ before computing $g''(x)$. Then compute the second derivative and evaluate $g''(x)$ at $x = \dfrac{\pi}{6}$

3. Use (quick) differentiation rules (like we did in class) to show that $\dfrac{d}{dx} \tan x = \sec^2 x$.

4. Use (quick) differentiation rules (like we did in class) to show that $\dfrac{d}{dx} \sec x = \sec x \tan x$.

5. Let $W(x) = \cos^2(2x) + \tan(2x) + 3\sec x$. Compute $W'\left(\dfrac{\pi}{6}\right)$. Simplify your answer completely.

6. For each function below, find the equation of the tangent line to the curve $f(x)$ at the given x-coordinate.

   (a) $f(x) = \sin x$ at $x = 0$. (We did this in class.)

   (b) $f(x) = \cos x$ at $x = \dfrac{\pi}{6}$.

   (c) $f(x) = \tan x$ at $x = \dfrac{\pi}{3}$.

7. Simplify the expression $6(x+1)^2(1-2x)^4 + (x+1)^3 4(1-2x)^3(-2)$. Hint: Common factors.

8. For later purposes we need to practice solving.

   (a) Consider the equation $x^2 + 2xyy' = 3y - 7y'$. Solve for y'.

   (b) Consider the equation $3y^2\dfrac{dy}{dx} - 5x^3y = 4x + 7\dfrac{dy}{dx}$. Solve for $\dfrac{dy}{dx}$.

9. Find **all** x-coordinates at which the graphs of the following functions have horizontal tangent lines. Please **simplify** your derivatives first. Why? You practiced doing that in #7 above.

   (a) $f(x) = (7x-3)^4(5x+2)^6$

   (b) $w(t) = t^2(1-t)^6$

Turn in solutions.