Math 111, Section 01, Fall 2012

Worksheet 5, Thursday, October 4, 2012

1. Let $g(x) = \dfrac{x}{1+3x^2}$.
   (a) Compute $g'(x)$. Simplify your answer.
   (b) Find the point(s) where the curve $y = g(x)$ has (a) horizontal tangent line(s).
   (c) Compute $g''(x)$. (We do not have the Chain Rule yet)

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

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

4. Compute $f'(x)$ where $f(x) = \sec x \tan x$

5. Compute $f'(x)$ where $f(x) = \dfrac{\sin x + \cos x}{\sec x \tan x}$. (Watch the denominator)

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. Compute $f''(x)$ where $f(x) = (x^4 - 5x^3 + 6)\sqrt{x}$

8. Consider $f(x) = x^{\frac{1}{3}}(x+4)$.
   (a) Compute $f'(x)$ and simplify your answer as much as possible, which means to write a single fraction with no negative exponents.
   (b) Compute the point where $f'(x) = 0$.

9. Compute the following limits.
   (a) $\lim_{x\to 0} \dfrac{x}{\sin x}$
   (b) $\lim_{x\to 0} \dfrac{\tan 3x}{\sin x}$ (A bit tricky)
   (c) $\lim_{x\to 0} \dfrac{\sin 5x}{x^3 - 4x}$

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

Turn in solutions.