Math 131 Week in Review
Sections 3.2, 3.3, 3.4
3/7/2010

$\frac{d}{dx}(c) = 0$ $\frac{d}{dx}(x) = 1$ $\frac{d}{dx}(x^n) = nx^{n-1}$ $\frac{d}{dx}(e^x) = e^x$

$(f \pm g)' = f' \pm g'$ $(cf)' = cf'$ $(fg)' = fg' + gf'$ $\left(\frac{f}{g}\right)' = \frac{gf' - fg'}{g^2}$

$\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$ $\lim_{\theta \to 0} \frac{\cos\theta - 1}{\theta} = 0$ $\frac{d}{dx}(\sin x) = \cos x$

$\frac{d}{dx}(\cos x) = -\sin x$ $\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{d}{dx}(\sec x) = \sec x \tan x$ $\frac{d}{dx}(\tan x) = \sec^2 x$ $\frac{d}{dx}(\cot x) = -\csc^2 x$

Differentiate the following functions:

1. $f(x) = \frac{1}{2} x^5 - 4x^3 + x - 2 + 3/x$

2. $g(t) = \frac{t^3 + t - 4}{2t - 3}$

3. $h(x) = \sqrt{5x} - \sqrt[3]{2x^2}$

4. $y = 3e^x - 2x^3 + 4$

5. $f(t) = (t + 2e^t)(5 - \sqrt{t})$

6. $h(x) = \dfrac{x - \sin x}{1 + \cos x}$

7. $g(x) = 5 \sec x - 3 \tan x$

8. $F(t) = 2te^t \cot t$

9. $f(x) = (2x^3 + 2)^4$

10. $g(x) = \cos(x^2 - x)$

11. $G(t) = \tan(4t - \sin 3t)$

12. $H(x) = (1 + \cos 2x)^2$

13. Find y'' for $y = \sec x$

14. Find an equation of the tangent line and normal line to $y = (2 - 3x)^2$ at $x = -1$.

15. The equation of motion of a particle is $s(t) = t^3 - 2t^2 + t - 4$, where s is in feet and t is in seconds. Find
    a) the velocity and acceleration as functions of t.

    b) the acceleration after 2 seconds.

    c) The acceleration when the velocity is 0.

16. For what value(s) of x does the graph of $F(x) = 2x^3 + x^2 - 4x - 5$ have a horizontal tangent?

17. Find an equation of the tangent line to $G(x) = 2x - \sqrt{x}$ that is parallel to the line $y = 1 - 3x$.

18. For $f(t) = x^2 - 2x - 3 + 1/x$, find $f''(-2)$.

19. Find an equation of the tangent line to $y = 2x \cos x$ at $x = \pi/2$.

20. Given $f(5) = 0$, $f'(5) = -1$, $g(5) = 3$, and $g'(5) = 2$, find $(fg)'(5)$, $(f/g)'(5)$, and $(g/f)'(5)$.

21. Given $h(x) = f(g(x))$ and the table of data below, find $h'(4)$.

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

22. An object moves along the x-axis so that its position at any time $t \geq 0$ is given by $s(t) = \sin(t^2 + 1)$. Find the velocity of the object as a function of t.

23. A ladder 12 ft long rests against a vertical wall. Let θ be the angle between the top of the ladder and the wall, and let x be the distance from the bottom of the ladder to the wall. If the bottom of the ladder slides away from the wall, how fast does x change with respect to θ when $\theta = \pi/3$?