Homework for Test #2 on Derivatives

Test 2 - Wed. 9/23

HW #5 due Friday, 9/11
- 2.1 #1-23 odd Find the derivative by the limit process
- 2.1 #29-32 all find the equation of the tangent line
- 2.1 #61-69 odd Use the alternate form to find the derivative
- 2.1 #71-79 odd Describe x-values where the function is differentiable (given graph)

HW #6 due Monday, 9/14
- 2.2 #3-51 odd Find the derivative using the basic derivative rules
- 2.2 #91-94 all; 101, 102 use the derivative to solve rate of change word problem

HW #7 due Wed. 9/16
- 2.3 #1-53 odd, 63-69 odd, Product and quotient rules
- 2.3 #75-81 all, 83-91 odd, 109-115 all Rates of change, second derivatives
- 2.4 #7-33 odd, 47-81 odd Chain rule

~~HW #8 due Tues. 9/22~~

HW #9 due Wed. 9/23
- 5.1 #45-61 odd, 71 Logarithmic functions
- 5.4 #39-57 odd Exponential functions
- 5.5 #41-55 odd Log and exp functions with other bases
- 5.8 #41-59 odd Inverse trig functions

Recommended:
Work through intuitive exercises on **Khan Academy**:
- Slope of secant lines
- Tangent lope is limiting value of secant slope
- Derivative intuition
- Visualizing derivatives
- Graphs of functions and their derivatives
- The formal and alternate form of the derivative
- Derivatives 1
- Recognizing slopes of curves
- Power rule
- Special derivatives

$[x^n]' = nx^{n-1}$

$[cf(x)]' = cf'(x)$

$[f(x) \pm g(x)]' = f'(x) \pm g'(x)$

$[f(x)g(x)]' = f'(x)g(x) + f(x)g'(x)$

$\left[\dfrac{f(x)}{g(x)}\right]' = \dfrac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

$[f(g(x))]' = f'(g(x)) \cdot g'(x)$

$[e^x]' = e^x$

$[a^x]' = a^x \ln a$

$[\ln x]' = \dfrac{1}{x}$

$[\log_a x]' = \dfrac{1}{x \ln a}$

$[\sin x]' = \cos x$

$[\cos x]' = -\sin x$

$[\tan x]' = \sec^2 x$

$[\cot x]' = -\csc^2 x$

$[\sec x]' = \sec x \tan x$

$[\csc x]' = -\csc x \cot x$

$[\arcsin x]' = \frac{1}{\sqrt{1-x^2}}$

$[\arctan x]' = \frac{1}{1+x^2}$

$[\operatorname{arcsec} x]' = \frac{1}{|x|\sqrt{x^2-1}}$

$[\arccos x]' = -[\arcsin x]'$

$[\operatorname{arccot} x]' = -[\arctan x]'$

$[\operatorname{arccsc} x]' = -[\operatorname{arcsec} x]'$

$$f(x) = \frac{\csc(\ln(x^2))}{37x + \sin x}$$

$$f'(x) = \left[(37x + \sin x)\left(-\csc(\ln(x^2))\cot(\ln(x^2)) \cdot \frac{1}{x^2} \cdot 2x\right) - \csc(\ln(x^2)) \cdot (37 + \cos x)\right] / (37x + \sin x)^2$$

$$f(x) = \cot\left(5^{\arcsin(4x^3)}\right)$$

$$f'(x) = \left[-\csc^2\left(5^{\arcsin(4x^3)}\right)\right] \cdot 5^{\arcsin(4x^3)} \cdot \ln 5 \cdot \frac{1}{\sqrt{1-(4x^3)^2}} \cdot 12x^2$$

$$f(x) = [\tan(\ln x)] \cdot [5^{2x}]$$

$$f'(x) = \left(\sec^2(\ln x) \cdot \frac{1}{x}\right) \cdot 5^{2x} + [\tan(\ln x)] \cdot 5^{2x} \ln 5 \cdot 2$$

$$f(x) = \frac{\arctan(5 \sin x)}{\log_3(4x^5)}$$

$$f'(x) = \frac{(\log_3(4x^5)) \cdot \frac{1}{1+(5\sin x)^2} \cdot 5\cos x - \arctan(5\sin x) \cdot \frac{1}{4x^5 \ln 3} \cdot 20x^4}{(\log_3(4x^5))^2}$$

$$f(x) = \sec^2(5\ln(x^2) - e^{3x})$$

$$= [\sec(5\ln(x^2) - e^{3x})]^2$$

$$f'(x) = 2[\sec(5\ln(x^2) - e^{3x})] \cdot \sec(5\ln(x^2) - e^{3x}) \tan(5\ln(x^2) - e^{3x}) \cdot \left(\frac{5}{x^2} \cdot 2x - e^{3x} \cdot 3\right)$$

$$f(x) = 5^{\cot(3x^2 - \ln 2x)}$$

$$f'(x) = 5^{\cot(3x^2-\ln 2x)} \cdot \ln 5 \cdot \left(-\csc^2(3x^2 - \ln 2x)\right) \cdot \left(6x - \frac{1}{2x} \cdot 2\right)$$

$$f(x) = 2^{3x} - \log_5(e^x - \sin(x^3)) + \operatorname{arcsec}(5x)$$

$$f'(x) = 2^{3x} \ln 2 \cdot 3 - \frac{1}{(\ln 5)(e^x - \sin x^3)} \cdot \left(e^x - \cos(x^3) \cdot 3x^2\right) +$$

$$+ \frac{1}{|5x|\sqrt{(5x)^2 - 1}} \cdot 5$$