Turn in Homework #4

- 2.1 #1-23odd — Find the derivative by the limit process
- 2.1 #29-32all — Find the equation of the tangent line
- 2.1 #61-69odd — Use the alternate form to ind the derivative
- 2.1 #71-79odd — Describe the x-values where the function is differentiable (given a graph)
- 2.2 #3-51 odd — Find derivative using basic rules
- 2.2 #91-94; 101,102 — Use derivative to solve rate of change word problems
- 2.3 #1-53odd, 63-69odd, 75-81all, 83-91odd, 109-115all — Product and quotient rules

2nd derivative

nth derivative

$y = 5x^3 - 3x^2 + 2$

$y' = 15x^2 - 6x$

$y'' = \boxed{30x - 6}$

Power Rule:

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

Constant Multiple Rule:

$$\frac{d}{dx}[cf(x)] = c\frac{d}{dx}[f(x)]$$

Sum & Difference:

$$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$$

Product Rule:

$$\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$$

Quotient Rule:

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

Chain Rule:

$$\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$$

Trig Functions:

$$\frac{d}{dx}[\sin x] = \cos x \qquad \frac{d}{dx}[\tan x] = \sec^2 x \qquad \frac{d}{dx}[\sec x] = \sec x \tan x$$

$$\frac{d}{dx}[\cos x] = -\sin x \qquad \frac{d}{dx}[\cot x] = -\csc^2 x \qquad \frac{d}{dx}[\csc x] = -\csc x \cot x$$

$$f(x) = 5\sin(3\cos 2x^5)$$

$$f'(x) = 5\cos(3\cos 2x^5)\cdot(-3\sin 2x^5)\cdot 10x^4$$

$$f(x) = (x)(\sin x)(\sqrt{x-1})$$

$$f'(x) = [x\cdot\sin x]'\cdot\sqrt{x-1} + (x\sin x)\cdot[(x-1)^{1/2}]'$$

$$= \boxed{(\sin x + x\cos x)\sqrt{x-1} + (x\sin x)\cdot\frac{1}{2}(x-1)^{-1/2}}$$

$$f(x) = \sec^2(\sin(3x))$$

$$= \left[\sec(\sin(3x))\right]^2$$

$$f(x)^2 = f(x^2)$$

$$f^2(x) = (f(x))^2$$

$$f'(x) = \boxed{2\sec(\sin 3x) \cdot \sec(\sin 3x)\tan(\sin 3x) \cdot \cos(3x) \cdot 3}$$

$$f(x) = \cos\left(\sqrt{\tan^2 x - 2x}\right)$$

$$= \cos\left[\left((\tan x)^2 - 2x\right)^{1/2}\right]$$

$$f'(x) = -\sin\left(\sqrt{\tan^2 x - 2x}\right) \cdot \frac{1}{2}\left(\tan^2 x - 2x\right)^{-1/2} \cdot \left(2\tan x \sec^2 x - 2\right)$$

1. $f(x) = \cot(5x^2 - 3x)$

2. $f(x) = \sqrt[3]{\csc(4x)}$

3. $f(x) = \dfrac{\sin 2x}{x^3}$

Test 2 on Derivatives - Friday, 12/13?

Homework #5

- **2.4 #7-33odd; 47-81odd** **Chain rule**

Quiz Time!