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

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

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

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

5. $\frac{d}{dx}[\csc x] =$ $-\csc x \cot x$

6. $\frac{d}{dx}[\pi^3] =$ 0

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

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

9. $\frac{d}{dx}[\sec x] =$ $\sec x \tan x$

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

11. $f(x) = 4x^2 - \cos x$

$f'(x) =$ $8x - (-\sin x) = 8x + \sin x$

12. $f(x) = \sin(5x^3 - 2)$

$f'(x) =$ $[\cos(5x^3 - 2)] \cdot (15x^2)$

13. $f(x) = (2x)\sin x$

$f'(x) =$ $2 \cdot \sin x + 2x \cdot \cos x$

14. $f(x) = \frac{3x}{x-1}$

$f'(x) =$ $\frac{(x-1) \cdot 3 - 3x(1)}{(x-1)^2}$

$f(x) = 3x \cdot (x-1)^{-1}$

$f'(x) = 3 \cdot (x-1)^{-1} + 3x \cdot [-(x-1)^{-2}]$

Find f'(x).

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

$f'(x) = \boxed{-\csc^2(5x^2-3x) \cdot (10x-3)}$

2. $f(x) = \sqrt[3]{\csc(4x)} = [\csc(4x)]^{1/3}$

$f'(x) = \frac{1}{3}[\csc(4x)]^{-2/3} \cdot (-\csc 4x \cot 4x) \cdot 4$

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

$f'(x) = \frac{x^3(\cos 2x)2 - \sin 2x(3x^2)}{(x^3)^2}$

$f(x) = (\sin 2x) \cdot (x^{-3})$

$f'(x) = 2\cos 2x \cdot (x^{-3}) + \sin 2x(-3x^{-4})$

$\frac{d}{dx}[2^x] = 2^x \cdot \ln 2$

$x^2 \neq 2^x$

$(2^x)' \neq x \cdot 2^{x-1}$

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

$\frac{d}{dx}[\log_2 x] = \frac{1}{x \ln 2}$

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

$$\log_2 8 = 3 \Leftrightarrow 2^3 = 8$$

$$\log_a b = c \Longleftrightarrow a^c = b$$

$$[e^x]' = e^x \cdot \ln e$$

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

$$[\ln x]' = \frac{1}{x \ln e}$$

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

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

$$\ln x = \log_e x$$

$$\log_e e = 1$$

$$\log_a a = 1$$

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

$$\left(\ln[f(x)]\right)' = \frac{1}{f(x)} \cdot f'(x)$$

$$f(x) = \ln\left[\sin\left(5x^3+2x\right)\right]$$

$$f'(x) = \frac{1}{\sin(5x^3+2x)} \cdot \left[\cos\left(5x^3+2x\right)\right] \cdot \left(15x^2+2\right)$$

$$= \left(15x^2+2\right)\cot\left(5x^3+2x\right)$$

$$f(x) = \overset{f}{(\sec x)} \cdot \overset{g}{\left(5^{\sin x}\right)}$$

$$f'(x) = \underset{f'}{(\sec x \tan x)} \cdot \underset{g}{5^{\sin x}} + \underset{f}{(\sec x)} \cdot \underbrace{5^{\sin x} \ln 5 \cdot \cos x}_{g'}$$

$$\left[a^{f(x)}\right]' = a^{f(x)} \cdot \ln a \cdot f'(x)$$

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

$$f'(x) = \frac{\sin x \left[x^2 \cdot \ln x\right]' - (x^2 \ln x) \cdot \left[\sin x\right]'}{(\sin x)^2}$$

$$= \frac{\sin x \left[2x \cdot \ln x + x^2 \cdot \frac{1}{x}\right] - (x^2 \ln x)(\cos x)}{\sin^2 x}$$

$$f(x) = \sqrt[3]{\sin^2(\ln(4x^9))}$$

$$\boxed{(a^m)^n = a^{m \cdot n}}$$

$$= \left[(\sin[\ln(4x^9)])^2\right]^{1/3}$$

$$= \left[\sin(\ln(4x^9))\right]^{2/3}$$

$$f'(x) = \frac{2}{3}\left[\sin(\ln(4x^9))\right]^{-1/3} \cdot \cos(\ln(4x^9)) \cdot \frac{1}{4x^9} \cdot 36x^8$$

$$f(x) = 5^{\sqrt[3]{4\log_2(3x^2-4x)}}$$

$$\left[5^{f(x)}\right]' = 5^{f(x)} \cdot \ln 5 \cdot f'(x)$$

$$f'(x) = 5^{\sqrt[3]{4\log_2(3x^2-4x)}} \cdot \ln 5 \cdot \left[\sqrt[3]{4\log_2(3x^2-4x)}\right]'$$

$$= 5^{\sqrt[3]{4\log_2(3x^2-4x)}} \cdot \ln 5 \cdot \frac{1}{3}\left(4\log_2(3x^2-4x)\right)^{-2/3} \cdot \frac{4}{\ln 2 \cdot (3x^2-4x)} \cdot (6x-4)$$

$[x^n]' =$

$[cf(x)]' =$

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

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

$\left[\frac{f(x)}{g(x)}\right]' =$

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

$[e^x]' =$

$[a^x]' =$

$[\ln x]' =$

$[\log_a x]' =$

$[\sin x]' =$

$[\cos x]' =$

$[\tan x]' =$

$[\cot x]' =$

$[\sec x]' =$

$[\csc x]' =$

$[\arcsin x]' =$

$[\arctan x]' =$

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

$[\arccos x]' =$

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

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

$$\arcsin x = \sin^{-1} x$$

Homework for Test 2 on Derivatives - Friday, 12/13?

Homework #4 (submitted Fri. 12/6)

- 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

Homework #5 (due Fri. 12/13)

- 2.4 #7-33odd; 47-81odd — Chain rule
- **5.1 #45-61, 71** — **Logarithmic functions**
- **5.4 #39-57** — **Exponential functions**
- **5.5 #41-55** — **Log and exp functions with other bases**
- **5.8 #41-59** — **Inverse trig functions**