

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{d}{dx} [\arccos x] = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} [\operatorname{arccot} x] = \frac{-1}{1+x^2}$$

$$\frac{d}{dx} [\operatorname{arccsc} x] = \frac{-1}{|x|\sqrt{x^2-1}}$$

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

5.8

44.  $f(x) = \operatorname{arcsec} 2x$

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

48.  $h(x) = x^2 \arctan x$

$$h'(x) = 2x \arctan x + x^2 \cdot \frac{1}{1+x^2}$$

52.  $y = \ln(t^2 + 4) - \frac{1}{2} \arctan \frac{t}{2}$

$$y' = \frac{1}{t^2+4} \cdot 2t - \frac{1}{2} \cdot \frac{1}{1+(\frac{t}{2})^2} \cdot \frac{1}{2}$$

$$\begin{aligned} \frac{d}{dx} [\arcsin x] &= \frac{1}{\sqrt{1-x^2}} \\ \frac{d}{dx} [\arctan x] &= \frac{1}{1+x^2} \\ \frac{d}{dx} [\operatorname{arcsec} x] &= \frac{1}{|x|\sqrt{x^2-1}} \\ \frac{d}{dx} [\arccos x] &= \frac{-1}{\sqrt{1-x^2}} \\ \frac{d}{dx} [\operatorname{arccot} x] &= \frac{-1}{1+x^2} \\ \frac{d}{dx} [\operatorname{arccsc} x] &= \frac{-1}{|x|\sqrt{x^2-1}} \end{aligned}$$

56.  $y = x \arctan 2x - \frac{1}{4} \ln(1 + 4x^2)$

$$y' = x \cdot \frac{1}{1+(2x)^2} \cdot 2 + \arctan 2x - \frac{1}{4} \cdot \frac{1}{1+4x^2} \cdot 8x$$

$$= \frac{2x}{1+4x^2} + \arctan 2x - \frac{2x}{1+4x^2} = \arctan 2x$$

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

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

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

$$\frac{d}{dx} [\arccos x] = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} [\operatorname{arccot} x] = \frac{-1}{1+x^2}$$

$$\frac{d}{dx} [\operatorname{arccsc} x] = \frac{-1}{|x|\sqrt{x^2-1}}$$

5.4 - Find the second derivative

80.  $f(x) = \frac{1}{x-2} = (x-2)^{-1}$

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

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

find  $f''(x)$

82.  $f(x) = \sec^2 \pi x = [\sec(\pi x)]^2$

$$f'(x) = 2 \sec \pi x (\sec \pi x \tan \pi x) \cdot \pi$$

$$= 2\pi [\sec(\pi x)]^2 \tan \pi x$$

$$f''(x) = [2\pi [\sec(\pi x)]^2]' \tan \pi x + [2\pi [\sec(\pi x)]^2] \cdot (\tan \pi x)'$$

$$= 2\pi \cdot 2\pi [\sec(\pi x)]^2 \tan \pi x \cdot \tan \pi x + 2\pi (\sec \pi x)^2 \cdot \sec^2 \pi x \cdot \pi$$

$$= 4\pi^2 \sec^2 \pi x \tan^2 \pi x + 2\pi^2 \sec^4 \pi x$$

5.4 Find the equation of the tangent line to the graph of  $f$  at the indicated point.

78.  $f(x) = \tan^2 x$  ;  $(\frac{\pi}{4}, 1)$

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

$$f(x) = [\tan x]^2$$

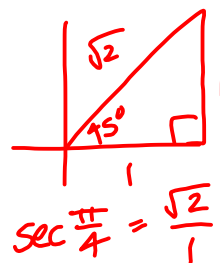
$$f'[g(x)] \cdot g'(x)$$

$$f'(x) = 2 \tan x \cdot \sec^2 x$$

$$m = f'(\frac{\pi}{4}) = 2 \cdot \tan \frac{\pi}{4} \cdot (\sec \frac{\pi}{4})^2$$

$$= 2 \cdot 1 \cdot 2$$

$$= 4$$



$$y - 1 = 4(x - \frac{\pi}{4})$$

$$y = 4x - \pi + 1$$

5.1

58.  $f(x) = \ln \sqrt[3]{\frac{x-1}{x+1}} = \ln \left(\frac{x-1}{x+1}\right)^{1/3}$

$$\ln(a^p) = p \cdot \ln a$$

$$\ln \frac{M}{N} = \ln M - \ln N$$

$$= \frac{1}{3} \ln \frac{x-1}{x+1} = \frac{1}{3} (\ln(x-1) - \ln(x+1))$$

$$= \frac{1}{3} \ln(x-1) - \frac{1}{3} \ln(x+1)$$

$$f'(x) = \frac{1}{3(x-1)} - \frac{1}{3(x+1)}$$

5.8-ish

$$f(x) = \arcsin(3x)$$

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

$$f(x) = \arctan(\ln(2x))$$

$$f'(x) = \frac{1}{1+(\ln 2x)^2} \cdot \frac{1}{2x} \cdot 2$$

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

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

Homework #5 (due Fri, 09/12)

- |                             |  |
|-----------------------------|--|
| • 2.4 #7-33 odd; #47-81 odd | 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                 |

**Test 2 - Fri, 09/12**