5.8

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

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

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

5.4 – Find the second derivative

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

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

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

$f(x) = x^5 - 3x^3 + 2x - 5$

$f'(x) = 5x^4 - 9x^2 + 2$

$f''(x) = 20x^3 - 18x$

$f'''(x) = 60x^2 - 18$

$f^{(4)}(x) = 120x$

$f^{(5)}(x) = 120$

$f^{(6)}(x) = 0$

$f(x) = 38x^{16}$

$f^{(17)}(x) = 0$

Find $f''(x)$

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

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

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

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

$\cdot (2\pi \sec^2(\pi x) \tan(\pi x))$

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

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

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

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

$= 2 \cdot 1 \cdot (\sqrt{2})^2 = 4$

$y - y_1 = m(x - x_1)$

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

$\boxed{y = 4x - \pi + 1}$

5.1

$\log(x^p) = p\log x$

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

$= \dfrac{1}{3}\ln\left[\dfrac{x-1}{x+1}\right]$

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

$f'(x) = \boxed{\dfrac{1}{3}\cdot\dfrac{1}{x-1} - \dfrac{1}{3}\cdot\dfrac{1}{x+1}}$

5.8-ish

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

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

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

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

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

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

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

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

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

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

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

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

Homework for **Test 2 on Derivatives - Monday, 12/16**

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
- **Test 2 Practice Problems (handout)**