2.4.55

$$f(x)=\frac{\cot x}{\sin x}$$

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

2.4.51

$$y=\sin(\pi x)^2$$

$$y'=\cos(\pi x)^2 \cdot 2\pi x \cdot \pi$$

5.8.48.

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

$(x^2)' \arctan x + x^2 (\arctan x)'$

$2x \arctan x + x^2 \cdot \frac{1}{x^2+1}$

$f(x) = x \sin x$

$x'(\sin x) + x(\sin x)'$

5.5

~~50. $\log_{10} 2x$~~

5.5

54. $\log_{10}\left(\frac{x^2-1}{x}\right) = \log_{10}(x^2-1) - \log_{10} x$

$= \frac{2x}{(x^2-1)\ln 10} - \frac{1}{x \ln 10}$

5.4

55. $f(x) = (e^{-x})(\ln x)$

$f'(x) =$

$e^{-x} \cdot \frac{1}{x} + \ln x \cdot e^{-x} \cdot (-1)$

$f \quad g' + g \quad f'$

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

$\log_4 10x \quad (10 \log_4 x)' = 10 (\log_4 x)'$

5.8

47. $f(x) = \frac{\arcsin 3x}{x} = \arcsin 3x \cdot x^{-1}$

$f'(x) = \arcsin 3x \cdot \left(-x^{-2}\right) + x^{-1} \cdot \frac{1}{\sqrt{1-(3x)^2}} \cdot 3$

$(\sin 2x)'$

$(2\sin x\cos x)'$

$\left(e^{-x}\right)' = e^{-x}\,(-x)'$

$= -e^{-x}$

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

$y = 7\arctan\left(27{,}552x^2\right)$

What happens if . . .

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

how to find y'?

$x^2 + y^2 = 1$

$y = \pm\sqrt{1-x^2}$

2.5 Implicit Differentiation

☆ $y = f(x)$

y is a function of x

$$\frac{d}{dx}[x] = 1 \quad ; \quad \frac{d}{dx}[y] = y'$$

6. $x^2y + y^2x = -2$

$$\frac{d}{dx}[x^2y + y^2x] = \frac{d}{dx}[-2]$$

$$x^2 \cdot y' + (x^2)'y + y^2 \cdot x' + (y^2)' \cdot x = 0$$

$$x^2y' + 2xy + y^2 + 2y \cdot y' \cdot x = 0$$

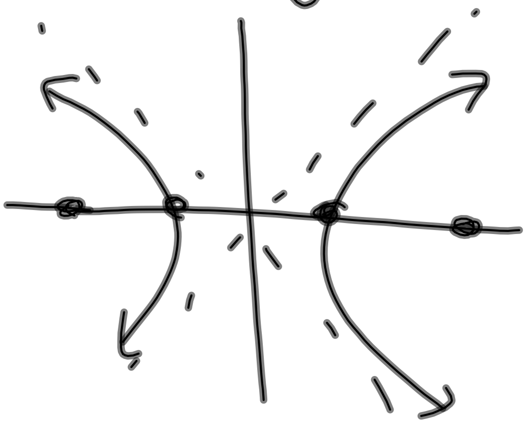
$$x^2y' + 2xyy' = -y^2 - 2xy$$

$$y'(x^2 + 2xy) = -y^2 - 2xy$$

$$y' = \frac{-y^2 - 2xy}{x^2 + 2xy}$$

$y = x^2$ m @ $(2,4)$
$y' = 2x$
$m = 2(2) = 4$

2. $x^2 - y^2 = 16$



$$\frac{d}{dx}\left[x^2 - y^2\right] = \frac{d}{dx}\left[16\right]$$

$$2x - 2yy' = 0$$

$$-2yy' = -2x$$

$$\boxed{y' = \frac{x}{y}}$$

8. $\left(\sqrt{xy}\right)' = \left(x - 2y\right)'$

$(xy)^{1/2} = x - 2y$

$$\frac{1}{2}(xy)^{-1/2} \cdot \left[x'y + xy'\right] = 1 - 2y'$$

$$\frac{1}{2\sqrt{xy}}\left(y + xy'\right) = 1 - 2y'$$

$y + xy' = 2\sqrt{xy} - 4y'\sqrt{xy}$

$$\frac{y}{2\sqrt{xy}} + \frac{xy'}{2\sqrt{xy}} = 1 - 2y'$$

$y'(x + 4\sqrt{xy}) = 2\sqrt{xy} - y$

$y' = \frac{2\sqrt{xy} - y}{x + 4\sqrt{xy}}$

$$\frac{xy'}{2\sqrt{xy}} + 2y' = 1 - \frac{y}{2\sqrt{xy}}$$

$y'\left(\frac{x}{2\sqrt{xy}} + 2\right) = 1 - \frac{y}{2\sqrt{xy}}$

$$y' = \frac{1 - \frac{y}{2\sqrt{xy}}}{\frac{x}{2\sqrt{xy}} + 2}$$

10. $(2\sin x\cos y)' = (1)'$

$2\sin x \cdot (\cos y)' + (2\sin x)' \cdot \cos y$

$2\sin x(-\sin y \cdot y') + 2\cos x \cdot \cos y = 0$

$y' = \dfrac{-\cancel{2}\cos x\cos y}{-\cancel{2}\sin x\sin y}$

$= \cot x\cot y$

2.5
#1, 3, 5, 7