Ex. $y = \sin^{-1}(\tan(2x))$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-(\tan(2x))^2}} \cdot \sec^2(2x) \cdot 2$$

p.162 #4 implicit

find dy/dx

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

$u = x^2 \quad v = x+y$

$u' = 2x \quad v' = 1+y'$

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

$$2x(x+y) + x^2 \cdot (1+y') = 1-y'$$

$$2x^2 + 2xy + x^2 + x^2y' + y' = 1$$

$$y'(x^2+1) = 1-3x^2-2xy$$

$$y' = \frac{1-3x^2-2xy}{x^2+1}$$

p. 162 #17 & normal

implicit diff., tangent line

$x^2 + xy - y^2 = 1 \quad (2,3)$

$2x + y + x\,dy/dx - 2y\,dy/dx = 0$

$x\,dy/dx - 2y\,dy/dx = -2x - y$

$dy/dx\,(x - 2y) = -2x - y$

$dy/dx = \frac{-2x-y}{x-2y}$

$dy/dx\Big|_{(2,3)} = \frac{-2(2)-3}{2-2(3)} = \frac{7}{4}$

$y = 3 + 7/4\,(x-2)$

$y = 3 - 4/7\,(x-2)$

$2x + y + x\,dy/dx - 2y\,dy/dx = 0$

$(2,3):\ 4 + 3 + 2y' - 6y' = 0$

$7 - 4y' = 0$

$y' = \frac{7}{4}$

Ex. position, velocity, acceleration

given: $s(t) = 3t^3 - 2t^2 + 5$

find: (a) $v(t)$, $a(t)$, $v(1)$, $a(1)$

$s(t) = 3t^3 - 2t^2 + 5$

$v(t) = 9t^2 - 4t$

$a(t) = 18t - 4$

$v(1) = 9(1)^2 - 4(1) = 5$

$a(1) = 18(1) - 4 = 14$

(b) what is position when acceleration $= 32$

$a(t) = 18t - 4 = 32$

$18t = 36 \quad t = 2$

$s(2) = 3(2)^3 - 2(2)^2 + 5$

$s(2) = 21$

$$\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \cdot \frac{du}{dx}$$

$$\frac{d}{dx}(\tan^{-1} u) = \frac{1}{u^2+1} \cdot \frac{du}{dx}$$

p. 181

$$y = e^{1+\ln x}$$

$$y = e^1 \cdot e^{\ln x}$$

$$= e \cdot x$$

$$y' = e$$

$$y' = e^{1+\ln x} \cdot \frac{1}{x}$$

$$= e \cdot e^{\ln x} \cdot \frac{1}{x}$$

$$= e \cdot x \cdot \frac{1}{x}$$

$$= e$$

#20 p. 181

$$s = 8^{-t}$$

$$\frac{ds}{dt} = 8^{-t} \cdot \ln 8 \cdot -1$$

$$= -8^{-t} \cdot \ln 8$$

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

$$= x$$

$$\frac{dy}{dx} = 1$$

general rule: $f(f^{-1}(x)) = x$