Implicit Differentiation

Find $\frac{dy}{dx}$ for

Ex. $\sin(x+y) = 0$

$D_x[\sin(x+y)] = D_x[0] = 0$

$\cos(x+y)[D_x(x+y)] = 0$

$\cos(x+y)[1 + y'] = 0$

$\cos(x+y) + \cos(x+y)y' = 0$

$y' = \frac{-\cos(x+y)}{\cos(x+y)} = -1$

Ex. Find $\frac{dy}{dx} = y'$ for $x^2 + xy + y^4 = 1$

$x^2 + xy + y^4 = 1$

$2x\frac{dx}{dx} + \left(\frac{dx}{dx}\right)y + x\left(\frac{dy}{dx}\right) + 4y^3\frac{dy}{dx} = \frac{d(0)}{dx} = 0$

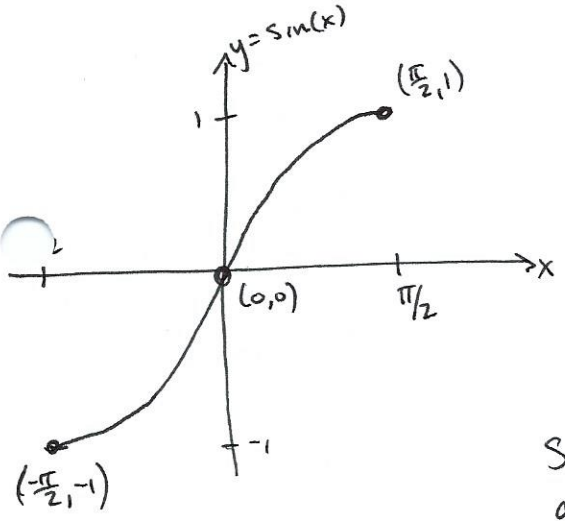
$2x + y + xy' + 4y^3y' = 0$

$2x + y + (x + 4y^3)y' = 0$

$(x+4y^3)y' = -(2x+y)$

$y' = \frac{-(2x+y)}{x+4y^3}$

Inverse Trig Functions

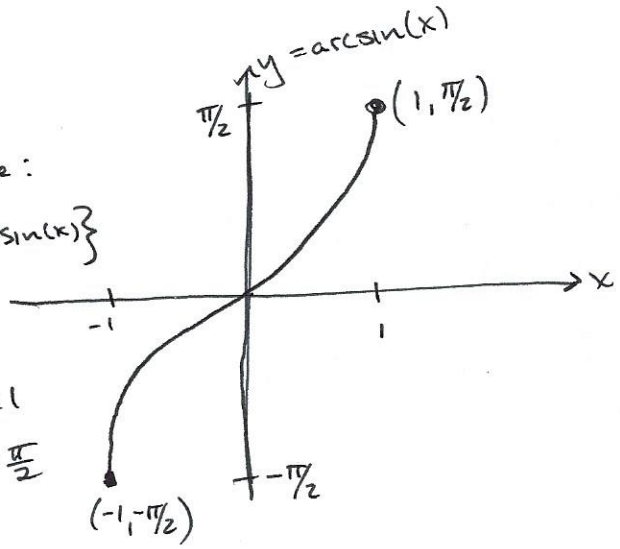


Domain $(\sin(x))$: $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$

Range $(\sin(x))$: $-1 \le y \le 1$

Sin has an inverse:

$\arcsin = \{(y,x) : y = \sin(x)\}$



Domain $(\arcsin(x))$: $-1 \le x \le 1$

Range $(\arcsin(x))$: $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

* $\sin(\arcsin(x)) = x \quad (-1 \le x \le 1)$

$\arcsin(\sin(x)) = x \quad (-\pi/2 \le x \le \pi/2)$

→ inverse trig functions undo eachother