

## C12 - 2.11 - Implicit Derivatives Notes

$y = x^3$ [Chain Rule]	$y = y^3$ [Chain Rule]	$2x = 3y$	$xy = 1$	$y = \frac{1}{x}$	$-2xy$ <del><math>-2xy</math></del> <del><math>-2(1y + y'x)</math></del> <del><math>-2xy</math></del> $-2y + y'(-2x)$
$\frac{dy}{dx} = 3x^2 \times \frac{dx}{dx}$	$\frac{dy}{dx} = 3y^2 \times \frac{dy}{dx}$	$\frac{2x}{3} = y$	$1(y) + y'(x) = 0$	$y = x^{-1}$	
$\frac{dy}{dx} = 3x^2 \times 1$	$\frac{dy}{dx} = 3y^1 \times y'$	$y' = \frac{2}{3}$	$y'x = -y$	$y' = -\frac{y}{x}$	
			$y' = -\frac{y}{x}$	$y' = -\frac{1}{x^2}$	
				...	
				Not Implicit	

$xy = 0$	$y^2 = x$	$y^2 = x$	$xy^2 = 2$	$y = \sqrt{xy}$
$1y + y'x = 0$	$2yy' = 1$	$y = \pm\sqrt{x}$	$1(y^2) + 2yy'(x) = 0$	$y^2 = xy$
$y'x = -y$	$y' = \frac{1}{2y}$	$y' = \frac{\pm 1}{2\sqrt{x}}$	$y^2 + 2xxy' = 0$	$2yy' = (1(y) + y'(x))$
$y' = -\frac{y}{x}$			$2xxy' = -y^2$	$2yy' = y + xy'$
			$y' = \frac{-y^2}{2xy}$	$2yy' - xy' = y$
				$y'(2y - x) = y$
				$y' = \frac{y}{2y - x}$

$$x^2 + xy + y^2 = 9$$

$$2x + (1(y) + y'(x)) + 2yy' = 0$$

$$2x + y + xy' + 2yy' = 0$$

$$xy' + 2yy' = -2x - y$$

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

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

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

$$3\cos x + \sin y = x^2$$

$$-3\sin x + \cos yy' = 2x$$

$$y' = \frac{2x + 3\sin x}{\cos y}$$

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

$$y' = -\sin(x + y)(1 + y')$$

$$y' = -\sin(x + y) - y'\sin(x + y)$$

$$y' - y'\sin(x + y) = -\sin(x + y)$$

$$y'(1 - \sin(x + y)) = -\sin(x + y)$$

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

$$x^2 + y^2 = 9$$

$$2x + 2yy' = 0$$

$$2yy' = -2x$$

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

$$y' = \frac{\pm x}{\sqrt{9 - x^2}}$$

$$x^2 + y^2 = 9$$

$$y = \pm\sqrt{9 - x^2}$$

$$y' = \frac{\pm x}{\sqrt{9 - x^2}}$$

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

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

$$y'' = -\left(\frac{1y^2 + x^2}{y^3}\right)$$

$$y'' = -\left(\frac{9}{y^3}\right)$$

$$y'' = \frac{\pm 9}{(9 - x^2)^{\frac{3}{2}}}$$

$$xcosy = \sin(x + y)$$

$$\cos y - xy'siny = \cos(x + y)(1 + y')$$

$$\cos y - xy'siny = 1\cos(x + y) + y'\cos(x + y)$$

$$\cos y - 1\cos(x + y) = y'\cos(x + y) + xy'siny$$

$$\cos y - 1\cos(x + y) = y'(\cos(x + y) + xsiny)$$

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