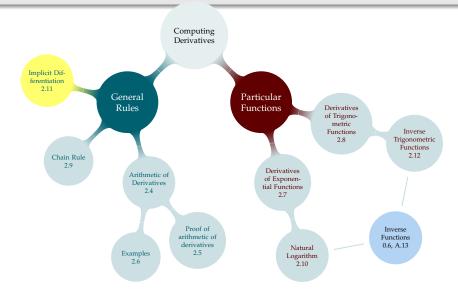
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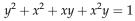


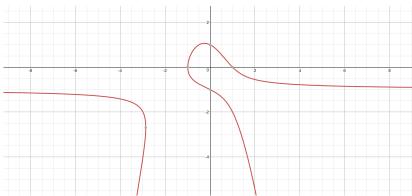
## **IMPLICITLY DEFINED FUNCTIONS**

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

Which of the following points are on the curve? (0,1), (0,-1), (0,0), (1,1)

If 
$$x = -3$$
, what is  $y$ ?





Still has a slope:  $\frac{\Delta y}{\Delta x}$  **Locally**, *y* is still a function of *x*.

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

Consider *y* as a function of *x*. Can we find  $\frac{dy}{dx}$ ?

$$\frac{\mathrm{d}}{\mathrm{d}x}[y] =$$

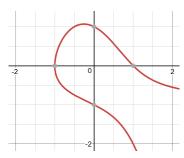
$$\frac{\mathrm{d}}{\mathrm{d}x}[y] = \frac{\mathrm{d}}{\mathrm{d}x}[x] =$$

$$\frac{\mathrm{d}}{\mathrm{d}x}[1] =$$

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

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

Necessarily,  $\frac{dy}{dx}$  depends on **both** y and x. Why?





Suppose  $x^4y + y^4x = 2$ . Find  $\frac{dy}{dx}$  at the point (1,1).

Suppose 
$$\frac{3y^2 + 2y + y^3}{x^2 + 1} = x$$
. Find  $\frac{dy}{dx}$  when  $x = 0$ , and

the equations of the associated tangent line(s).

Use implicit differentiation to differentiate  $\log(x)$ , x > 0.

$$\log x = y(x)$$
$$x = e^{y(x)}$$

Use implicit differentiation to differentiate  $\log |x|$ , x < 0.

Use implicit differentiation to differentiate  $\log_a(x)$ , where a > 0 is a constant and x > 0.

Use implicit differentiation to differentiate  $\log_a |x|$ , a > 0.

## Included Work

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https://www.desmos.com/calculator (accessed 19 October 2017),5

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