ex: $x + \overbrace{3x}^{\text{product rule}}\underbrace{y} - 2y^2 = 2$ at $(1,1)$

$1 + 3x(1)\frac{dy}{dx} + y3 - 4y\frac{dy}{dx} = 0$

$1 + 3x\frac{dy}{dx} + 3y - 4y\frac{dy}{dx} = 0$

$3x\frac{dy}{dx} - 4y\frac{dy}{dx} = -1 - 3y$

$\frac{dy}{dx}\frac{(3x - 4y)}{(3x - 4y)} = \frac{-1-3y}{(3x-4y)}$

$\frac{dy}{dx} = \frac{-1-3y}{(3x-4y)}$ $\quad \frac{-1-3(1)}{(3(1)-4(1))} = \frac{-4}{-1} = 4$

ex: $\overbrace{3x^2y}^{\text{product rule}} + 2x - y^2 = 7$

$3x^2(1\frac{dy}{dx}) + y(6x) + 2 - 2y\frac{dy}{dx} = 0$

$3x^2\frac{dy}{dx} - 2y\frac{dy}{dx} = -2 - 6xy$

$\frac{dy}{dx}\frac{(3x^2 - 2y)}{(3x^2 - 2y)} = \frac{-2-6xy}{(3x^2-2y)}$

$\frac{dy}{dx} = \frac{-2-6xy}{(3x^2-2y)}$ ✓

ex: Find $\frac{d^2y}{dx^2}$ of $x^2 + y^2 = 25$

First Derivative: $2x + 2y\frac{dy}{dx} = 0$

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

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

Second derivative: Start over!

$\frac{dy}{dx} = \frac{-x}{y}$ high quotient rule!
low

$$\frac{d^2y}{dx^2} = \frac{y(-1) - (-x)(1\frac{dy}{dx})}{(y)^2}$$

Problem!!! There's still a $\frac{dy}{dx}$ in the answer.....

BUT earlier we said $\frac{dy}{dx} = \frac{-x}{y}$ .... so sub it in!

$$\frac{d^2y}{dx^2} = \frac{-y + x\left(\frac{-x}{y}\right)}{y^2} = \frac{-y - \frac{x^2}{y}}{y^2}$$