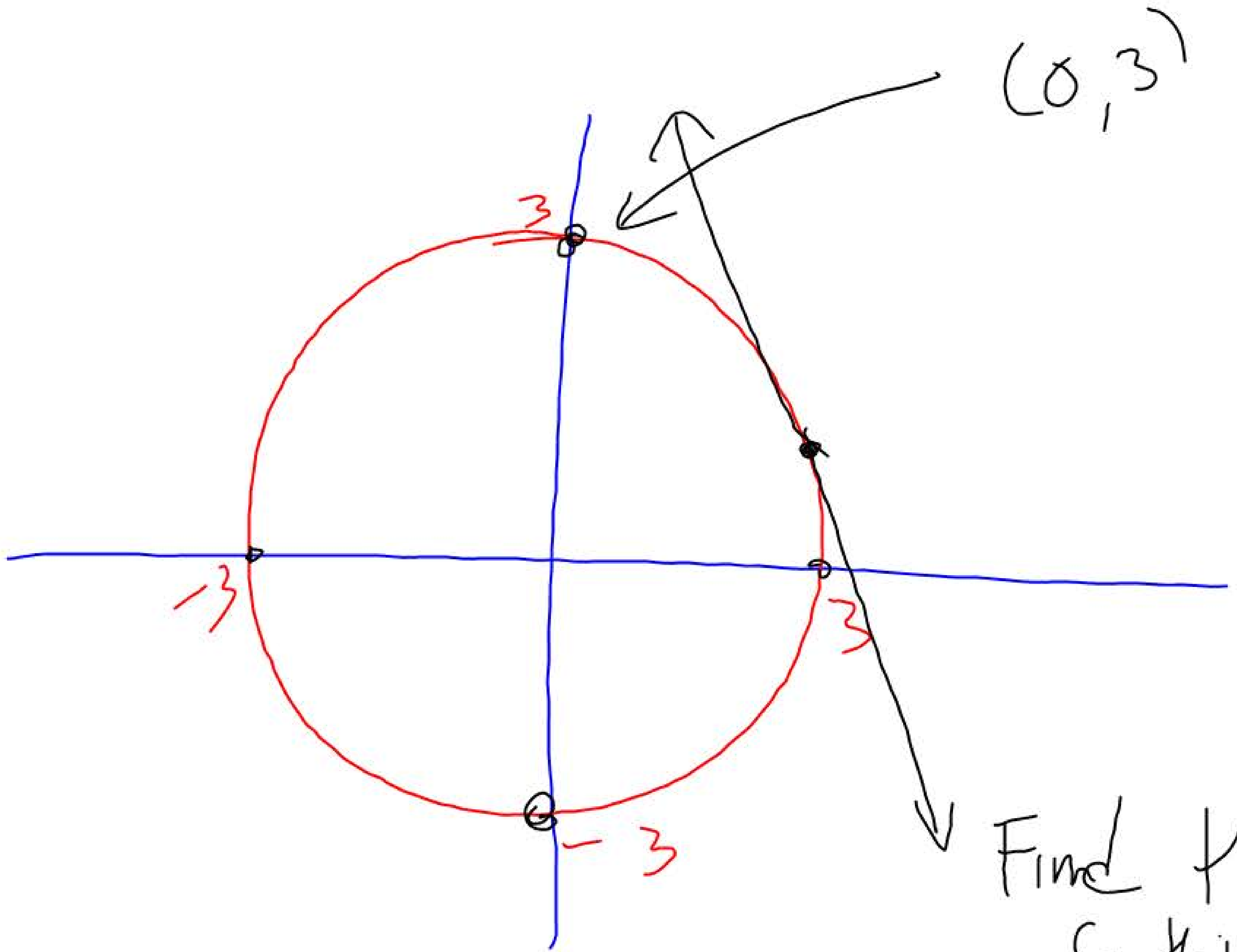
$x^2 + y^2 = 9$

$\left[(x-h)^2 + (y-k)^2 = r^2 \right]$



Find the eq. of this line

Implicit Differentiation

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

$$\Rightarrow \frac{d}{dx}\left[x^2 + y^2\right] = \frac{d}{dx}[9]$$

$$\Rightarrow 2x + 2y(\underline{y'}) = 0$$

$$\Rightarrow 2y(y') = -2x$$

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

gives the slope of the tangent line at any point on graph find $\frac{dy}{dx}$ for:

[note: $y' = \frac{dy}{dx}$]

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

$\left(-\frac{1}{2}, 0\right)$

$$\Rightarrow \frac{d}{dx}\left[xy^2 - 2x\right] = \frac{d}{dx}\left[\frac{3y}{x^3} + 1\right]$$

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

$$\Rightarrow 2x^7y\frac{dy}{dx} + x^6y^2 - 2x^6 = 3x^3\frac{dy}{dx} - 9x^2y$$

$$\Rightarrow 2x^7 y \frac{dy}{dx} - 3x^3 \frac{dy}{dx} = 2x^6 - x^6 y^2 - 9x^2 y$$

$$\Rightarrow \frac{dy}{dx}\left[2x^7 y - 3x^3\right] = 2x^6 - x^6 y^2 - 9x^2 y$$

$$\Rightarrow \frac{dy}{dx} = \frac{2x^6 - x^6 y^2 - 9x^2 y}{2x^7 y - 3x^3}$$

$$\text{at } \left(-\tfrac{1}{2}, 0\right),\ m = \frac{2\left(-\tfrac{1}{2}\right)^6 - \cancel{\left(-\tfrac{1}{2}\right)^6(0)} - \cancel{9\left(-\tfrac{1}{2}\right)^2(0)}}{\cancel{2\left(-\tfrac{1}{2}\right)^7(0)} - \underbrace{3\left(-\tfrac{1}{2}\right)^3}}$$

$$= \frac{2}{3}\left(\frac{1}{2}\right)^3 = \frac{1}{3(2^2)} = \frac{1}{12}$$

line tangent to orig. eq. at $(-1/2, 0)$

is $\quad (0) = \left(\frac{1}{12}\right)\left(-\frac{1}{2}\right) + b \Rightarrow b = \frac{1}{24}$

$$\boxed{y = \frac{1}{12}x + \frac{1}{24}}$$

Find $\frac{dy}{dx}$ for $2y^3 + xy = 1$

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