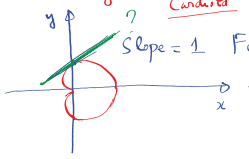
$y^2\cos(xy) = \frac{dy}{dx}\left(2y - \sin(xy) - xy\cos(xy)\right)$

$$\frac{dy}{dx} = \frac{y^2\cos(xy)}{2y - \sin(xy) - xy\cos(xy)}$$

Find the tangent line to a curve at a point implicitly.

Cardioid Equation: $x^2+y^2 = (2x^2+2y^2-x)^2$



Find an equation for the tangent line to the graph of the cardioid at point $(0, \frac{1}{2})$

Oct 5-4:32 PM

$x^2+y^2 = (2x^2+2y^2-x)^2$ Find $\frac{dy}{dx}$

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

$2x + 2y\frac{dy}{dx} = 2\cdot(2x^2+2y^2-x)\left(4x + 4y\frac{dy}{dx} - 1\right)$

Plug $x=0$; $y=\frac{1}{2}$ to this equation.

$\frac{dy}{dx} = \cancel{2}\cdot\frac{1}{\cancel{2}}\cdot\left(2\frac{dy}{dx} - 1\right)$

$\frac{dy}{dx} = 2\frac{dy}{dx} - 1$; $\frac{dy}{dx} = 1$

Slope = 1 $\quad y - \frac{1}{2} = 1\cdot(x-0)$

Point: $(0, \frac{1}{2})$ $\quad y - \frac{1}{2} = x$; $y = x + \frac{1}{2}$

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Find the second derivative $\frac{d^2y}{dx^2}$ explicitly.

$x^2 + y^2 = 25$; $\frac{dy}{dx} = -\frac{x}{y}$

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

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

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

$= -\frac{\frac{y^2+x^2}{y}}{y^2} = -\frac{y^2+x^2}{y^3}$.

Oct 5-4:40 PM