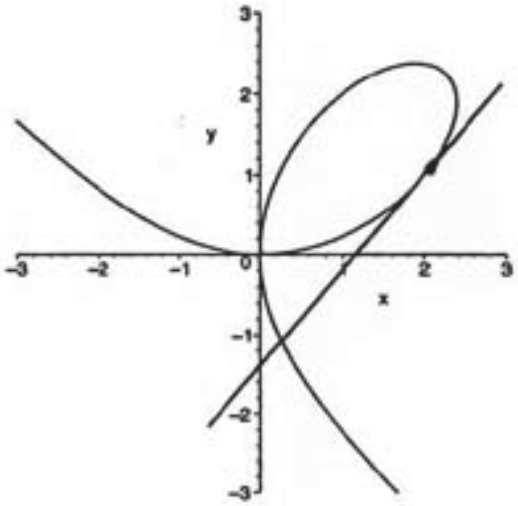
7. (12 points) The figure shows the graph of the curve $2x^3 + 2y^3 - 9xy = 0$, called a *folium of Descartes* because it was studied by Descartes in about 1638.



(a) Using the equation above, show that the point $(2, 1)$ lies on the curve.

$16 + 2 - 18 = 0$ ✓

(b) Compute the derivative $\frac{dy}{dx}$ of the function of x defined implicitly by the equation.

$$6x^2 + 6y^2\frac{dy}{dx} - 9y - 9x\frac{dy}{dx} = 0$$

$$(6y^2 - 9x)\frac{dy}{dx} = 9y - 6x^2 \longrightarrow \frac{dy}{dx} = \frac{9y - 6x^2}{6y^2 - 9x}$$

(c) What is the slope of the tangent line to the curve at the point $(2, 1)$?

$$\left.\frac{dy}{dx}\right|_{(2,1)} = \frac{9-24}{6-18} = \frac{-15}{-12} = \frac{5}{4}$$

(d) Write the equation of the tangent line to the curve at the point $(2, 1)$. Draw the graph of this line on the figure.

$$y - 1 = \frac{5}{4}(x - 2)$$

$$y = \frac{5}{4}x - \frac{3}{2}$$