

Problem: Find the slope of the tangent line to a curve.

1. If the curve is given by $y = f(x)$, calculate $\frac{dy}{dx}$.

If the curve is given by an equation involving x and y , use implicit differentiation to find $\frac{dy}{dx}$.

2. If the curve is given by parametric equations

$$x = f(t), \quad y = g(t),$$

$$\text{Calculate } \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{g'(t)}{f'(t)}$$

Example:

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

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

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

$$\begin{cases} x = 3 \sin t \\ y = 3 \cos t \end{cases}$$

$$\frac{dy}{dx} = \frac{-3 \sin t}{3 \cos t} = -\tan t = -\frac{x}{y}$$