2.6. Implicit Differentiation and Related Rates

Example

Find $\frac{dy}{dx}$ if $x + \frac{1}{y} = 4$.

Implicit Differentiation

Suppose an equation defines y *implicitly* as a differentiable function of x. To find the derivative of y,

1. Differentiate both sides of the equation with respect to x. Remember that y is really a *function of x* and use the chain rule when differentiating terms containing y.
2. Solve the differentiated equation algebraically for $\frac{dy}{dx}$.

Example

Find $\frac{dy}{dx}$ using implicit differentiation if $x + \frac{1}{y} = 4$.

Implicit Differentiation

Example

Find $\frac{dy}{dx}$ if $4x - x^3y^2 = 2y$.

Implicit Differentiation

Example

Find the equation of the tangent line to the curve $x^2y^2 - 3xy = 5x + y + 1$ at the point $(0, -1)$.