

## 3.7 Implicit Differentiation

EXAMPLE: Find  $\frac{dy}{dx}$  if  $xy + y = 3$ .

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

EXAMPLE: Find  $\frac{dy}{dx}$  if  $xy + y = 3$ .

EXAMPLE: Use implicit differentiation to find  $\frac{dy}{dx}$  if  $x^2y + y^2x = -2$ .

EXAMPLE: Use implicit differentiation to find  $\frac{dy}{dx}$  if  $(2xy + 3)^2 = \sin y$ .

EXAMPLE: Solve for  $\frac{dy}{dx}$  by using implicit differentiation:  $e^{xy} + x^2 - y^2 = 10$ .

EXAMPLE: Use implicit differentiation to find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  if  $x^3 + y^3 = 8$ .

EXAMPLE: Verify that  $(2, 1)$  is on the curve  $x^3 + y^3 = 4xy + 1$ . Then find lines that are **(a)** tangent and **(b)** normal to the curve at  $(2, 1)$ .

EXAMPLE: Verify that  $(1, 0)$  is on the curve  $2 \cos(\pi x - y) - y = -2x$ . Then find lines that are **(a)** tangent and **(b)** normal to the curve at  $(1, 0)$ .

EXAMPLE: You are given that  $x \cdot \cos y = 1$ . Find  $\frac{dy}{dx}$  by implicit differentiation and evaluate the derivative at the given point,  $\left(2, \frac{\pi}{3}\right)$ .