

Find dy/dx by implicit differentiation:

1. $x^2 + y^2 = 36$

2. $x^2 - y^2 = 16$

3. $x^{1/2} + y^{1/2} = 9$

4. $x^3 + y^3 = 8$

5. $x^3 - xy + y^2 = 4$

6. $x^2y + y^2x = -2$

7. $x^3y^3 - y = x$

8. $\sqrt{xy} = x - 2y$

9. $x^3 - 3x^2y + 2xy^2 = 12$ 10. $2 \sin x \cos y = 1$

11. $\sin x + 2 \cos 2y = 1$ 12. $(\sin \pi x + \cos \pi y)^2 = 2$

13. $\sin x = x(1 + \tan y)$ 14. $\cot y = x - y$

15. $y = \sin(xy)$ 16. $x = \sec \frac{1}{y}$

Find dy/dx by implicit differentiation:

1. $x^2 + y^2 = 36$

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

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

2. $x^2 - y^2 = 16$

3. $x^{1/2} + y^{1/2} = 9$

$$\frac{1}{2}x^{-1/2} + \frac{1}{2}y^{-1/2} \frac{dy}{dx} = 0$$

$$\frac{1}{2\sqrt{y}} \frac{dy}{dx} = -\frac{1}{2\sqrt{x}}$$

4. $x^3 + y^3 = 8$

5. $x^3 - xy + y^2 = 4$

$$3x^2 - y - x \frac{dy}{dx} + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx}(2y - x) = y - 3x^2$$

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

6. $x^2y + y^2x = -2$

7. $x^3y^3 - y = x$

$$3x^2y^3 + x^3 \cdot 3y^2 \frac{dy}{dx} - \frac{dy}{dx} = 1$$

$$\frac{dy}{dx}(3y^2 - 1) = 1 - 3x^2y^3$$

$$= \frac{1 - 3x^2y^3}{3y^2 - 1}$$

8. $\sqrt{xy} = x - 2y$

9. $x^3 - 3x^2y + 2xy^2 = 12$

$$3x^2 - 6xy - 3x^2 \frac{dy}{dx} + 2y^2 + 2x \cdot 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx}(4xy - 3x^2) = 6xy - 3x^2 - 2y^2$$

$$\frac{dy}{dx} = \frac{6xy - 3x^2 - 2y^2}{4xy - 3x^2}$$

10. $2 \sin x \cos y = 1$

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

$$\frac{dy}{dx} = \frac{\cos x \cos y}{\sin x \sin y} = \cot x \cot y$$

Find dy/dx by implicit differentiation and evaluate the derivative at the indicated point.

Equation

Point

$$1y + xy' = 0$$

$$y' = -\frac{y}{x}$$

$$y' = -\frac{-1}{-4} = -\frac{1}{4}$$

21. $xy = 4$

 $(-4, -1)$

22. $x^2 - y^3 = 0$

 $(1, 1)$

23. $y^2 = \frac{x^2 - 4}{x^2 + 4}$

 $(2, 0)$

$$x^2 - y^3 = 0$$

$$2x - 3y^2 \frac{dy}{dx} = 0$$

$$y' = \frac{(x^2 + 4)(2x) - (x^2 - 4)(2x)}{(x^2 + 4)^2 \cdot 2y}$$

$$\frac{dy}{dx} = \frac{2x}{3y^2} = \frac{2(1)}{3(1)^2} = \frac{2}{3}$$

$$y' = \text{undef.}$$