

Calculus 1 Workbook

Implicit differentiation



IMPLICIT DIFFERENTIATION

■ 1. Use implicit differentiation to find dy/dx at (3,4).

$$4x^3 - 3xy^2 + y^3 = 28$$

 \blacksquare 2. Use implicit differentiation to find dy/dx.

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

■ 3. Use implicit differentiation to find dy/dx.

$$3x^2 = (3xy - 1)^2$$

■ 4. Use implicit differentiation to find dy/dx.

$$\sin(2x + 5y) = \cos^2 x + \cos^2 y$$

■ 5. Use implicit differentiation to find dy/dx.

$$e^{2xy} = 3x^3 - \ln(xy^2)$$

■ 6. Use implicit differentiation to find dy/dx at (0, -5).

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



EQUATION OF THE TANGENT LINE WITH IMPLICIT DIFFERENTIATION

- 1. Use implicit differentiation to find the equation of the tangent line to $5y^2 = 2x^3 5y + 6$ at (3,3).
- 2. Use implicit differentiation to find the equation of the tangent line to $5x^3 = -3xy + 4$ at (2, -6).
- 3. Use implicit differentiation to find the equation of the tangent line to $4y^2 + 8 = 3x^2$ at (6, -5).
- 4. Use implicit differentiation to find the equation of the tangent line to $2x + 3y 5 = \ln(x^5 + y^5)$ at (1,0).
- 5. Use implicit differentiation to find the equations of the tangent and normal line to $\cos x = \sin(2y) + 9$ at $(\pi/2,\pi)$.
- 6. Use implicit differentiation to find the equation of the tangent line to $4x^2 xy + y^2 = 6$ at the points in the second and third quadrant when x = -1.

HIGHER-ORDER DERIVATIVES

■ 1. Find the second and third derivatives of the function at x = -1.

$$y = 2x^5 - 3x^4 + x^3 + x^2 - 7$$

- 2. Find the second derivative of the function $y = -3x^{\frac{2}{3}} + x^{-\frac{1}{2}}$.
- 3. Find the second derivative of the function.

$$y = -3x^7 \sin x$$

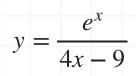
■ 4. Find the second and the third derivatives of the function.

$$y = \ln(x^5 \sqrt{x})$$

■ 5. Find the second derivative of the function.

$$y = \frac{2x}{\sin(x^2)}$$

■ 6. Find the second derivative of the function at x = 0.





SECOND DERIVATIVES WITH IMPLICIT DIFFERENTIATION

■ 1. Use implicit differentiation to find d^2y/dx^2 .

$$2x^3 = 2y^2 + 4$$

■ 2. Use implicit differentiation to find d^2y/dx^2 .

$$4x^2 = 2y^3 + 4y - 2$$

■ 3. Use implicit differentiation to find d^2y/dx^2 at (0,3).

$$3x^2 + 3y^2 = 27$$

■ 4. Use implicit differentiation to find d^2y/dx^2 at (2,1).

$$e^{x-2y} = 2x - y$$

 \blacksquare 5. Use implicit differentiation to find y''.

$$y\sin x = 7 - 2y^2$$

■ 6. Use implicit differentiation to find y'' at (0,3).

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