

### Skill Builder: Topic 3.2 – Implicit Differentiation (Circuit)

Begin in the first cell marked #1 and find the derivative of each given function. To advance in the circuit, search for your answer and mark that cell #2. Continue in this manner until you complete the circuit. Show all pertinent work.

<p># 1</p> <p>Find <math>\frac{dy}{dx}</math> for the circle <math>x^2 + y^2 = 25</math> and evaluate <math>\frac{dy}{dx}</math> at the point <math>(3, -4)</math>.</p>	<p>Ans: undefined</p>	<p># ____</p>	<p>Ans: <math>-\frac{2}{\sqrt{3}}</math></p>
<p># ____</p> <p>Find the slope of the tangent line to <math>\cos(\pi x) = x^7 y^2</math> at the point <math>(-1, 1)</math>.</p>	<p>Ans: <math>-\frac{25}{4}</math></p>	<p># ____</p>	<p>Ans: 1</p>
<p># ____</p> <p>If <math>\sin y + x = \frac{7}{2}</math>, find the rate of change at the point <math>\left(3, \frac{\pi}{6}\right)</math>.</p>	<p>Ans: <math>\frac{16}{3}</math></p>	<p># ____</p>	<p>Ans: <math>\frac{1}{8}</math></p>
<p>Find the slope of the tangent line to the graph of <math>2xy^2 + xy = y</math> when <math>y = 1</math>.</p>	<p>Ans: <math>-\frac{25}{4}</math></p>	<p>Find the slope of the tangent line to the graph of <math>2xy^2 + xy = y</math> when <math>y = 1</math>.</p>	<p>Ans: <math>-\frac{2}{\sqrt{3}}</math></p>
<p>For the circle centered at the origin with radius 4 and equation <math>x^2 + y^2 = 16</math>, find <math>\frac{dx}{dt}</math> at the first quadrant point where <math>x = 2</math> if <math>\frac{dy}{dt} = -3</math> at that instant.</p>	<p>Ans: <math>\frac{16}{3}</math></p>	<p>The relation <math>y^2(4 - x) = x^2</math> has a slope of _____ when <math>x = 3</math> and <math>y = -3</math>.</p>	<p>Ans: 1</p>

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**Ans:**  $\frac{1-3y}{3x+2y}$

Calculate the slope of the tangent line to  $x^2 - xy + y^2 = 19$  at the point  $(2,5)$ .

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**Ans:**  $3\sqrt{3}$

Find  $\frac{dy}{dx}$  for  $3\sqrt[3]{x} - 12\sqrt[3]{y^4} = 9$ .

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**Ans:**  $\frac{1}{16\sqrt[3]{x^2y}}$

Find  $\frac{dy}{dx}$  for  $\tan(xy) = x + y$ .

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**Ans:**  $\frac{3}{4}$

Calculate  $\frac{dy}{dx}$  for  $3x + xy = y$  and find the instantaneous rate of change at the point  $\left(\frac{1}{4}, 1\right)$ .

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**Ans:**  $-\frac{9}{2}$

Find  $\frac{dy}{dx}$  for the hyperbola  $x^2 - y^2 = 16$ .

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**Ans:**  $\frac{7}{2}$

Find  $\frac{dy}{dx}$  for  $y^2 = \frac{1}{2x+5}$ .

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**Ans:**  $-\frac{5}{2}$ 

For the relation  $\sqrt{x+y} = 3x$ , find the value of  $x$  for which  $\frac{dy}{dx} = 17$  when  $y = 8$ .

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**Ans:**  $\frac{-1}{y(2x+5)^2}$ 

Find the slope of the tangent line to the ellipse  $x^2 + 4y^2 = 16$  at the point  $(4, 0)$ .

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**Ans:**  $\frac{1 - y \sec^2(xy)}{x \sec^2(xy) - 1}$ 

Write the  $y$ -intercept of the equation of the tangent line to  $x^2 + y^2 = 25$  in the third quadrant where  $x = -3$ .

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**Ans:**  $\frac{x}{y}$ 

Given the relation  $x + 3xy + y^2 = 2x$ , find  $\frac{dy}{dx}$ .