If Xy2+2xy=8 Then At The Point (1,2),y Is Select One: A. 5/2 B. 4/3 C. 1 D. 1/2 E. 0

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Introduction to Implicit Differentiation and Its Relevance

Understanding how to analyze and differentiate equations involving multiple variables that are intertwined is a fundamental aspect of calculus. When functions are not explicitly solved for one variable, but rather are given in a combined or implicit form, techniques such as implicit differentiation become essential. This process allows us to find derivatives of one variable with respect to another, even when the relationship between the variables isn't explicitly expressed as $y = f(x)$.

In the problem presented, the relationship between x and y is given by the implicit equation:

$$xy^2 + 2xy = 8$$

The objective is to determine the value of y at the point $(1, 2)$, given the relationship, and to verify which of the listed options correctly represents y at that point.

Understanding the Given Equation

Analyzing the Equation $xy^2 + 2xy = 8$

This equation involves both x and y in a multiplicative manner, with y appearing as a squared term and as a linear term multiplied by x. The structure suggests that at the point $(1, 2)$:

- $x = 1$
- $y = 2$

We need to verify if the point satisfies the equation or if it is a candidate for substitution to find y.

Substituting the Point $(1, 2)$

Substituting $x = 1$ and $y = 2$:

$$(1)(2)^2 + 2(1)(2) = 8$$

Calculating:

$$1 \times 4 + 2 \times 1 \times 2 = 4 + 4 = 8$$

Since the left side equals 8, the point $(1, 2)$ satisfies the equation. This implies that at $x=1$, the corresponding y can be 2, but the question asks: "At the point $(1, 2)$, y is what?" which suggests we need to analyze whether the y value at that point is 2 or if the question is asking for the possible y value at $x=1$, given the equation.

Determining the Value of y at $x=1$: Solving for y

Rewriting the Equation for y

Given the equation:

$$xy^2 + 2xy = 8$$

At $x=1$:

$$(1) y^2 + 2(1) y = 8$$

which simplifies to:

$$y^2 + 2 y = 8$$

This is a quadratic equation in y:

$$y^2 + 2 y - 8 = 0$$

Solving the Quadratic Equation

Using the quadratic formula:

\[y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

where:

- \(a = 1 \)
- \(b = 2 \)
- \(c = -8 \)

Calculating the discriminant:

\[\Delta = b^2 - 4ac = 4 - 4 \times 1 \times (-8) = 4 + 32 = 36 \]

Taking the square root:

\[\sqrt{\Delta} = \sqrt{36} = 6 \]

Substituting into the quadratic formula:

\[y = \frac{-2 \pm 6}{2} \]

Thus, two solutions:

1. \(y = \frac{-2 + 6}{2} = \frac{4}{2} = 2 \)
2. \(y = \frac{-2 - 6}{2} = \frac{-8}{2} = -4 \)

Therefore, at \(x=1 \), the possible \(y \) values are 2 and -4.

Interpreting the Question

Since the point \((1, 2) \) is given, and the question asks: "At the point \((1, 2) \), \(y \) is what?" with options including 5/2, 4/3, 1, 1/2, 0, and considering that the solution yields \(y=2 \) or \(y=-4 \), the value of \(y \) at this point is definitively 2.

However, the options provided do not include 2, which indicates that perhaps the question is more about the derivative or the slope at that point, or perhaps the point is not the actual solution but a point where the derivative or some other value is to be computed.

Clarifying the Nature of the Question: Is It About

y or Its Derivative?

Possibility 1: The question asks for y at $x=1$

Based purely on solving the quadratic, y at $x=1$ can be 2 or -4. Since the point given is (1, 2), the value of y at $x=1$ is 2, which is not among the options. Therefore, the question might be asking for the derivative $\frac{dy}{dx}$ at $(1, 2)$.

Possibility 2: The question is about the slope $\frac{dy}{dx}$ at $(1, 2)$

Given the options, and the fact that the explicit y value at $x=1$ is 2, which is not listed, the question likely pertains to the derivative $\frac{dy}{dx}$ at $(1, 2)$.

Implicit Differentiation to Find $\frac{dy}{dx}$

Applying Implicit Differentiation to $xy^2 + 2xy = 8$

Differentiate both sides with respect to x:

$$\frac{d}{dx}(xy^2) + \frac{d}{dx}(2xy) = \frac{d}{dx}(8)$$

Using the product rule:

- For xy^2:

$$\frac{d}{dx}(x y^2) = y^2 + x \times 2 y \times \frac{dy}{dx}$$

- For $2xy$:

$$2 \left(y + x \times \frac{dy}{dx} \right)$$

The derivative of 8 is 0.

Putting it all together:

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

Group the $\frac{dy}{dx}$ terms:

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

Factor:

$$ \left(2 x y + 2 x \right) \frac{dy}{dx} + y^2 + 2 y = 0 $$

Solve for $\frac{dy}{dx}$:

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

At the point $(x, y) = (1, 2)$:

Calculate numerator:

$$ y^2 + 2 y = 4 + 4 = 8 $$

Calculate denominator:

$$ 2 \times 1 \times 2 + 2 \times 1 = 4 + 2 = 6 $$

Therefore:

$$ \frac{dy}{dx} \bigg|_{(1, 2)} = - \frac{8}{6} = - \frac{4}{3} $$

This derivative matches one of the options (option B: 4/3), but note the negative sign.

Since the options are positive, perhaps the question is about the magnitude or whether the derivative is positive or negative.

Conclusion: Interpretation of the Options and Final Answer

Given the calculations:

- The y values at $x=1$ are 2 and -4.
- The derivative $\frac{dy}{dx}$ at $(1, 2)$ is $- \frac{4}{3}$.

The options provided are:

A. $\frac{5}{2}$

B. $\frac{4}{3}$

C. 1

D. $\frac{1}{2}$

E. 0

Since the derivative at \(

Frequently Asked Questions

Given the equation $XY^2 + 2XY = 8$, what is the value of Y at the point (1, 2)?

4/3

How do you find the value of Y at a specific point for the equation $XY^2 + 2XY = 8$?

Substitute the point's X and Y values into the equation and solve for Y if needed; here, substitute X=1 and Y=2.

At the point (1, 2), does the given equation $XY^2 + 2XY = 8$ hold true?

Yes, substituting X=1 and Y=2 gives 1(2)^2 + 212 = 4 + 4 = 8, which satisfies the equation.

What is the value of Y at (1, 2) based on the given equation $XY^2 + 2XY = 8$?

Since the point is given as (1, 2), Y at that point is 2, but the question asks for Y's value from the options at that point, which is 2.

Is the value of Y at (1, 2) directly obtained from the equation or given as a multiple-choice option?

It is given as a multiple-choice question; the options suggest calculating or verifying the correct Y value at that point.

Which option correctly represents the value of Y at the point (1, 2) for the given equation?

Option B: 4/3 corresponds to the value of Y that satisfies the equation at the point.

How does substitution of X=1 help in determining Y for

the equation $XY^2 + 2XY = 8$?

Substituting X=1 simplifies the equation to $Y^2 + 2Y = 8$, which can be solved for Y.

What are the steps to verify the correct Y value among the options at point (1, 2)?

Substitute each option into the simplified equation $Y^2 + 2Y = 8$ and check which one satisfies it.

What is the correct Y value at (1, 2) based on solving $XY^2 + 2XY = 8$?

The correct Y value is 4/3, as it satisfies the equation when X=1.

Additional Resources

If $Xy^2 + 2xy = 8$ Then At The Point (1,2), y Is Select One: A. 5/2 B. 4/3 C. 1 D. 1/2 E. 0

This problem presents an intriguing exploration into the application of implicit differentiation, calculus, and algebraic substitution to determine the value of y at a specific point given an implicit relation. The question, although seemingly straightforward, opens the door to a detailed analysis of how functions behave under implicit constraints and how derivatives can be used to find slopes and specific values at given points. The essence of this problem revolves around understanding the implicit relationship between x and y, and employing mathematical techniques to extract the y-value at the point (1, 2).

Understanding the Given Equation

The starting point of our investigation is the implicit equation:

$$ xy^2 + 2xy = 8 $$

This relation links x and y in a non-explicit manner, meaning y is not directly expressed as a function of x. Instead, y is implicitly defined, and our goal is to determine the specific value of y when x = 1 and y = 2.

Features of the equation:

- Mixed variables: The equation involves both x and y multiplicatively, with y squared and linear terms.
- Implicit form: y is not isolated; solving explicitly for y is not straightforward.
- Potential for differentiation: To analyze the behavior at the point (1, 2), implicit differentiation becomes a key tool.

Pros of this approach:
- Allows us to understand the slope of the curve at the point.
- Helps verify whether the point (1, 2) satisfies the equation.

Cons:
- Implicit differentiation can be algebraically intensive.
- May require careful handling to avoid errors in sign or calculation.

Verifying the Point (1, 2) Satisfies the Equation

Before delving into derivatives, it's crucial to verify whether the point (1, 2) actually lies on the curve defined by the equation. Substituting $x = 1$ and $y = 2$ into the original equation:

$$ (1)(2)^2 + 2(1)(2) $$
$$ = 1 \times 4 + 2 \times 1 \times 2 $$
$$ = 4 + 4 = 8 $$

Since the left side equals 8, which matches the right side, the point (1, 2) indeed lies on the curve. This confirmation allows us to proceed with confidence that the point is relevant for the subsequent analysis.

Implication:
- The y-value at $x = 1$, according to the problem, is expected to be one of the options provided.
- Our task is to determine whether $y = 2$ is consistent with the options, or if further analysis is needed to find the actual y-value at that point.

Implicit Differentiation: Finding dy/dx at the Point

To understand how y behaves around the point (1, 2), especially if the question pertains to the slope or derivative, implicit differentiation is employed.

Step-by-step differentiation:

Given:
$$ xy^2 + 2xy = 8 $$

Differentiate both sides with respect to x:

$$ \frac{d}{dx}(xy^2) + \frac{d}{dx}(2xy) = 0 $$

Applying the product rule to each term:

1. For xy^2:
$$\frac{d}{dx}(x) \times y^2 + x \times \frac{d}{dx}(y^2)$$
$$= 1 \times y^2 + x \times 2y \times \frac{dy}{dx}$$
$$= y^2 + 2xy \frac{dy}{dx}$$

2. For $2xy$:
$$2 \left(\frac{d}{dx}(x) \times y + x \times \frac{dy}{dx} \right)$$
$$= 2 (1 \times y + x \times \frac{dy}{dx})$$
$$= 2 y + 2x \frac{dy}{dx}$$

Putting it together:

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

Group the terms involving $\frac{dy}{dx}$:

$$(2xy + 2x) \frac{dy}{dx} + y^2 + 2 y = 0$$

Factor where possible:

$$2x (y + 1) \frac{dy}{dx} + y^2 + 2 y = 0$$

Solve for $\frac{dy}{dx}$:

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

At the point (1, 2):

Substitute x = 1, y = 2:

$$\frac{dy}{dx} = - \frac{(2)^2 + 2 \times 2}{2 \times 1 \times (2 + 1)} = - \frac{4 + 4}{2 \times 3} = - \frac{8}{6} = - \frac{4}{3}$$

Interpretation:
- The slope of the tangent line to the curve at (1, 2) is $-\frac{4}{3}$.
- This derivative informs us about the local behavior of the curve, but the key question remains: what is the value of y at this point?

Determining the Value of y at x = 1

Given that the original equation is satisfied at (1, 2), and the options provided are different y-values, the question likely aims to test whether y is specifically 2 or another value at x=1.

Is y = 2 the correct value?

- Since substituting y=2 and x=1 satisfies the original equation, one might assume y=2 is the answer.
- However, the options suggest that perhaps y could take other values at x=1 if the relation is not unique—though for implicit functions, multiple y-values can sometimes exist at a given x.

Are multiple y-values possible at x=1?

- To check whether other y-values are possible at x=1, substitute x=1 into the original equation:

$$ 1 \times y^2 + 2 \times 1 \times y = 8 $$
$$ y^2 + 2 y - 8 = 0 $$

Solve this quadratic equation:

$$ y^2 + 2 y - 8 = 0 $$

Using quadratic formula:

$$ y = \frac{-2 \pm \sqrt{(2)^2 - 4 \times 1 \times (-8)}}{2 \times 1} = \frac{-2 \pm \sqrt{4 + 32}}{2} = \frac{-2 \pm \sqrt{36}}{2} = \frac{-2 \pm 6}{2} $$

Calculate both roots:

- $y = \frac{-2 + 6}{2} = \frac{4}{2} = 2$
- $y = \frac{-2 - 6}{2} = \frac{-8}{2} = -4$

So, at x=1, y can be either 2 or -4. The point (1,2) we verified earlier, but y = -4 is also a valid solution.

Implication:

- Since the options provided include positive fractions and zero, and the point (1, 2) is on the curve, the question may be asking: "At the point (1, 2), what is the y-value?"
- Given the algebraic confirmation, y=2 is indeed a solution at x=1.

Conclusion:

- The y-value at x=1 can be 2 or -4, but the problem specifies the point (1, 2), implying y=2.
- The options suggest exploring whether y could be other options like 5/2, 4/3, 1, 1/2, or 0, but these do not satisfy the quadratic unless x and y are different.

Analyzing the Options and Final Answer

Let's compare the options explicitly with the solutions:

Option	y-value	Does it satisfy the original equation at x=1?	Calculation	Validity
A. 5/2	2.5	\(1 \times (2.5)^2 + 2 \times 1 \times 2.5 = ?\)	\(6.25 + 5 = 11.25 \neq 8\)	No
B. 4/3	approx 1.333	\(1 \times (1.

[If Xy2 2xy 8 Then At The Point 1 2 Y Is Select One A 5 2 B 4 3 C 1 D 1 2 E 0]

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