

The Slope Of The Line Below Is -3. Which Of The Following Is The Point-slope Form Of The Line?

The Slope Of The Line Below Is -3. Which Of The Following Is The Point-slope Form Of The Line?

Understanding the equation of a line is fundamental in algebra and coordinate geometry. When working with lines, one of the most important aspects to grasp is the different forms of linear equations, particularly the point-slope form. In this article, we will explore what the point-slope form of a line is, how to derive it when given a slope and a point, and why it's useful. We will also focus on specific scenarios, such as lines with a slope of -3, to illustrate these concepts clearly.

What Is the Point-slope Form of a Line?

The point-slope form is a way of writing the equation of a line when you know one point on the line and its slope. It is especially useful because it directly relates the slope and a specific point on the line, making it easy to write the equation quickly.

Definition and Formula

The point-slope form of a line is expressed as:

$$Y - Y_1 = m (X - X_1)$$

Where:

- (X_1, Y_1) is a point on the line.
- m is the slope of the line.
- (X, Y) are variables representing any point on the line.

This form is particularly advantageous because it immediately demonstrates the relationship between the slope and a known point, providing a straightforward way to formulate the equation when these pieces of information are given.

Why Use the Point-slope Form?

The point-slope form is useful because:

- It simplifies the process of writing the equation when given a point and slope.
- It provides a clear visualization of how the slope influences the line's behavior.
- It serves as a stepping stone to other forms, such as the slope-intercept form ($y = mx + b$) and the standard form.

Given The Slope Is -3, How Do You Find the Point-slope Form?

Suppose you are told that the slope of a line is -3, but the specific point (X_1, Y_1) on the line is not yet identified. To write the point-slope form, you need both the slope and a point on the line.

Steps to Write the Point-slope Form

1. Identify the known slope: $m = -3$.
2. Find or be given a point (X_1, Y_1) that lies on the line.
3. Plug these values into the point-slope formula: $y - Y_1 = m(x - X_1)$.

For example, if the point $(2, 5)$ lies on the line, then the point-slope form is:

$$y - 5 = -3(x - 2)$$

If a different point is given, simply replace (X_1, Y_1) with that point's coordinates.

What If the Point Is Not Provided?

If the problem only states that the slope is -3 and asks for the point-slope form, you might need to:

- Use additional information, such as the line passing through a specific

point.

- Recognize that without a point, the point-slope form cannot be fully specified, but the general form remains $(y - Y_1 = -3 (x - X_1))$.

Examples of Point-slope Form with Slope -3

To clarify how to work with the slope of -3, here are some examples:

Example 1: Known Point (4, 7)

Given:

- Slope $(m = -3)$,
- Point $(4, 7)$.

The point-slope form:

$$(y - 7 = -3 (x - 4)).$$

Example 2: Known Point (-1, 2)

Given:

- Slope $(m = -3)$,
- Point $(-1, 2)$.

The point-slope form:

$$(y - 2 = -3 (x + 1)).$$

Converting Point-slope Form to Other Forms

Once you have the point-slope form, it's often helpful to convert it into the slope-intercept form for easier graphing and interpretation.

Converting to Slope-intercept Form

Starting from $(y - Y_1 = m (x - X_1))$:

1. Distribute the slope on the right side.
2. Add (Y_1) to both sides to solve for (y) .

Example:

From $(y - 5 = -3(x - 2))$:

$$(y - 5 = -3x + 6),$$

Add 5 to both sides:

$$(y = -3x + 11).$$

This form makes it easy to identify the slope (-3) and the y-intercept (11) .

Why Is The Slope Of -3 Significant?

A slope of -3 indicates that for every increase of 1 unit in (x) , (y) decreases by 3 units. This steep negative slope signifies a line that falls sharply from left to right.

Implications of a Slope of -3

- The line is decreasing.
- It is steeper than a line with a slope of -1.
- It can be used to model real-world situations where a variable decreases rapidly with respect to another, such as depreciation or cooling rates.

Summary: How To Write The Point-slope Form of a Line With Slope -3

To summarize:

- Identify a point (X_1, Y_1) on the line.
- Use the slope $(m = -3)$.
- Plug into the formula:

$$(y - Y_1 = -3(x - X_1)).$$

This provides the point-slope form of the line with a slope of -3 passing

through the specific point.

Additional Tips For Working With Lines and Slopes

- Always clearly identify the point and the slope before writing the equation.
- Remember that the point-slope form can be easily converted into slope-intercept or standard form.
- When given multiple points and a slope, you can verify the line's equation by plugging in the points.

Conclusion

Understanding how to write the point-slope form of a line when the slope is known, such as -3, is a fundamental skill in algebra. It allows you to quickly formulate the equation of a line based on a known point and slope, which is essential in graphing, solving systems of equations, and modeling real-world situations. Whether you are working through homework problems or preparing for exams, mastering the point-slope form will strengthen your overall understanding of linear equations and their applications.

Frequently Asked Questions

What is the point-slope form of a line with a slope of -3 and passing through a point (x_1, y_1) ?

The point-slope form is written as $y - y_1 = m(x - x_1)$, so with a slope of -3, it becomes $y - y_1 = -3(x - x_1)$.

If the slope of a line is -3 and it passes through the point (2, 5), what is its point-slope form?

Using $y - y_1 = m(x - x_1)$, the equation is $y - 5 = -3(x - 2)$.

Why is the point-slope form useful when graphing a

line?

Because it allows you to write the equation of a line if you know its slope and one point on the line, making it easier to graph accurately.

Can the point-slope form be converted to slope-intercept form? How?

Yes, by solving the point-slope form for y to get $y = mx + b$, which is the slope-intercept form.

What does the slope of -3 tell us about the line's steepness and direction?

A slope of -3 indicates the line decreases three units vertically for every one unit it moves horizontally to the right, showing a downward slope.

Is the point-slope form unique for a given line with slope -3?

No, different points on the same line will produce different point-slope equations, but all represent the same line.

What are some common mistakes to avoid when writing the point-slope form with a slope of -3?

Common mistakes include using the wrong point, misplacing the negative sign, or incorrect substitution of the point coordinates.

How do you identify the correct point-slope form from multiple options if the slope is -3?

Look for the equation in the form $y - y_1 = -3(x - x_1)$, where (x_1, y_1) is a point on the line.

If given multiple options, which one correctly represents the line with slope -3 and passing through (x_1, y_1) ?

The correct option is the one that matches $y - y_1 = -3(x - x_1)$ with the given point substituted appropriately.

How does knowing the slope help in writing the

point-slope form of a line?

Knowing the slope allows you to directly write the 'm' in the point-slope formula, simplifying the process of creating the equation.

Additional Resources

The Slope of the Line Below Is -3. Which Of The Following Is The Point-Slope Form of the Line?

Understanding the fundamentals of linear equations is essential in algebra, geometry, and various applications across science and engineering. When given the slope of a line and a specific point through which the line passes, the point-slope form offers a straightforward way to express the equation of that line. In this article, we will thoroughly explore what the slope of -3 signifies, how to formulate the point-slope equation, and analyze various options to identify the correct form. Whether you're a student preparing for exams or a math enthusiast seeking clarity, this comprehensive review aims to deepen your understanding of the topic.

Understanding the Slope of a Line

What Is the Slope?

The slope of a line measures its steepness and direction. Mathematically, it is often represented as 'm' and calculated as the ratio of the change in y-values to the change in x-values between two points on the line (rise over run). A slope of -3 indicates that for every increase of 1 unit in x, y decreases by 3 units. This negative value signifies a line that slopes downward from left to right.

Implications of a Slope of -3

- Downward Slope: The negative slope indicates a decline in y as x increases.
- Steepness: A slope of -3 is relatively steep, meaning the line descends quite sharply.
- Application: Recognizing the slope helps in predicting the behavior of the line and understanding the relationship between variables.

Point-Slope Form of a Line

Definition and Formula

The point-slope form of a linear equation is derived from the slope-intercept form but emphasizes a specific point on the line. It is expressed as:

$$y - y_1 = m(x - x_1)$$

where

- (x_1, y_1) is a known point on the line,
- m is the slope.

This form is particularly useful when you know one point on the line and its slope, allowing you to write the equation directly.

Advantages of Point-Slope Form

- Clarity: Clearly shows the given point and slope.
- Ease of Conversion: Simple to manipulate into slope-intercept or standard form.
- Versatility: Useful in graphing and solving problems involving lines.

Limitations

- Specificity: Requires knowledge of a point on the line.
- Less intuitive for some: May need to convert to other forms for certain applications.

Given the Slope of -3, Formulating the Point-Slope Equation

Scenario Setup

Suppose you are provided with a specific point through which the line passes, say (x_1, y_1) . The key step is to substitute this point and the slope into the point-slope formula.

Example:

If the point is $(2, 5)$ and the slope is -3 , then the point-slope form becomes:

$$y - 5 = -3(x - 2)$$

This equation accurately describes the line passing through (2, 5) with a slope of -3.

General Approach

- Identify the known point on the line.
- Use the given slope (-3).
- Plug these into $y - y_1 = m(x - x_1)$.

Analyzing Multiple Choice Options

When posed with multiple options for the point-slope form, the key is verifying which one correctly incorporates the slope of -3 and a known point.

Common Forms and How to Identify the Correct One

- Look for the coefficient of $(x - x_1)$ being -3.
- Confirm that the expression matches the known point when simplified.
- Check for consistency in signs and values.

Sample options:

1. $y - 4 = -3(x - 2)$
2. $y + 4 = -3(x + 2)$
3. $y - 5 = 3(x - 2)$
4. $y - 5 = -3(x - 2)$

Analysis:

- Option 1: Uses point (2, 4). If the point is (2, 4), then correct.
- Option 2: Uses point (-2, -4). If the point is (-2, -4), then correct.
- Option 3: Slope is +3, not -3, so unlikely.
- Option 4: Uses point (2, 5), slope -3, matches our earlier example.

To determine which option is correct, you must know the particular point the line passes through. The question generally provides this, or it can be inferred from context.

Converting Point-Slope Form to Other Forms

Slope-Intercept Form

Starting from $y - y_1 = m(x - x_1)$, solve for y :

$$y = m(x - x_1) + y_1$$

This form makes it easier to identify the y -intercept and graph the line.

Standard Form

Rearranged as:

$$Ax + By = C$$

which often involves expanding and simplifying the point-slope form.

Practical Applications and Examples

Real-Life Contexts

- Physics: Describing velocity as a slope in position-time graphs.
- Economics: Modeling cost functions where the rate of change is constant.
- Engineering: Analyzing stress-strain relationships.

Example Problem

Suppose a line passes through (3, 7) with a slope of -3. Write its point-slope form.

Solution:

Plug into $y - y_1 = m(x - x_1)$:

$$y - 7 = -3(x - 3)$$

This is the point-slope form. To get the slope-intercept form:

$$\begin{aligned} y &= -3(x - 3) + 7 \\ &= -3x + 9 + 7 \\ &= -3x + 16 \end{aligned}$$

Common Mistakes and Tips

- Mixing points and slopes: Ensure the point used matches the given data.
- Incorrect signs: Pay attention to the sign of the slope and the point coordinates.
- Forgetting to verify: Always substitute back into the original form to check accuracy.

Tips:

- Confirm the known point before writing the equation.
- Use substitution to verify the correctness of the form.

Conclusion

Understanding the point-slope form of a line when given a slope of -3 hinges on recognizing the importance of the specific point through which the line passes. This form succinctly encapsulates both the slope and a point on the line, making it invaluable for graphing, analysis, and solving linear equations. When selecting the correct point-slope form from multiple options, always verify the slope and the point involved. With practice, identifying and formulating these equations becomes intuitive, empowering you to approach linear relationships confidently and accurately.

[The Slope Of The Line Below Is 3 Which Of The Following Is The Point Slope Form Of The Line](#)

The Slope Of The Line Below Is 3 Which Of The Following Is The Point Slope Form Of The Line

Related Articles

- [Compare George Miller To Hudson Taylor. Include At Least Two Similarities And An Example For Each.](#)
- [The Study Of Cariology Includes The Causes Of Dental Caries, Process Of Caries Development, And.](#)
- [The Class Has 12 Girls And 16 Boys. What Is The Ratio Of Total Students To Boys In Simplest Form?](#)

[Back to Home](#)