

What Is The Y Intercept Of The Line $-3x+2y=6$?O-3-223

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Understanding the concept of the y-intercept is fundamental in the study of algebra and coordinate geometry. When analyzing linear equations, identifying the y-intercept provides valuable insight into the graph's behavior and the relationship between variables. In this article, we will explore the specific question: What is the y-intercept of the line $-3x + 2y = 6$? We will delve into the methods used to find the y-intercept, interpret its significance, and apply this knowledge to graphing and solving related problems.

Understanding the Y-Intercept in Linear Equations

What Is the Y-Intercept?

The y-intercept of a line is the point where the line crosses the y-axis on a coordinate plane. This point has coordinates $(0, y)$, meaning the x-coordinate is zero, and the y-coordinate is the value where the line intersects the y-axis.

Key points about the y-intercept:

- It indicates the value of y when $x = 0$.
- It is a crucial component in graphing linear equations.
- It provides insight into the starting point of the line on the y-axis.

Why Is the Y-Intercept Important?

The y-intercept helps in:

- Quickly sketching the graph of a line.
- Understanding the initial value or baseline of the relationship between variables.
- Solving real-world problems where the intercept represents a starting quantity or initial condition.

Converting the Equation to Slope-Intercept Form

To find the y-intercept of the line given by the equation $-3x + 2y = 6$, it is often easiest to convert the equation into slope-intercept form, $y = mx + b$, where:

- m is the slope of the line.
- b is the y-intercept.

Step-by-Step Conversion of $-3x + 2y = 6$

1. Start with the original equation:

$$-3x + 2y = 6$$

2. Isolate the y-term:

Add $3x$ to both sides:

$$2y = 3x + 6$$

3. Divide both sides by 2 to solve for y:

$$y = (3/2)x + 3$$

Now, the equation is in slope-intercept form: $y = (3/2)x + 3$.

Identifying the Y-Intercept from the Equation

In the slope-intercept form $y = (3/2)x + 3$, the coefficient of x is the slope, and the constant term is the y-intercept.

Thus:

- Y-Intercept (b) = 3

This means the line crosses the y-axis at the point (0, 3).

Visualizing the Line and Its Y-Intercept

Plotting the Y-Intercept

- The point $(0, 3)$ is the y-intercept.
- To graph the line, start at this point on the y-axis.

Using the Slope to Find Additional Points

The slope $m = 3/2$ indicates that:

- For every 2 units moved horizontally to the right (positive x-direction), the line moves 3 units vertically upwards.
- Conversely, moving 2 units to the left (negative x-direction), the line moves 3 units down.

Example points:

- Starting at $(0, 3)$:
- Move 2 units right and 3 units up: $(2, 6)$
- Move 2 units left and 3 units down: $(-2, 0)$

Plotting these points provides a clearer picture of the line.

Applying the Concept to Real-World Problems

Understanding the y-intercept can help in various practical contexts:

- Economics: Determining the starting value of a cost or profit function.
- Physics: Identifying initial conditions like initial velocity or position.
- Business: Estimating initial sales or expenses before any sales are made.

Additional Methods to Find the Y-Intercept

While converting to slope-intercept form is straightforward, there are alternative methods:

Method 1: Substituting $x = 0$

- Step 1: Plug $x = 0$ into the original equation:

$$-3(0) + 2y = 6$$

- Step 2: Simplify:

$$0 + 2y = 6$$

- Step 3: Solve for y :

$$2y = 6 \rightarrow y = 3$$

- Result: The y-intercept is $(0, 3)$.

Method 2: Graphical Approach

- Plot the equation on a coordinate plane.
- Find the point where the line crosses the y-axis.
- Read off the y-coordinate at $x = 0$.

Summary and Key Takeaways

- The y-intercept of a line is where it crosses the y-axis, corresponding to $x = 0$.
- To find the y-intercept of the equation $-3x + 2y = 6$, convert the equation into slope-intercept form:

$$y = (3/2)x + 3$$

- The y-intercept is therefore 3, at the point (0, 3).
- Knowing the y-intercept allows for easy graphing and understanding of the line's behavior.
- You can find the y-intercept by substituting $x = 0$ into the original equation or algebraically manipulating the equation.

Practice Problems

1. Find the y-intercept of the equation $4x - y = 8$.
2. Determine the y-intercept of the line $2y + 5x = 10$.
3. Given the equation $y = -2x + 7$, what is the y-intercept?

Answers:

1. $y = 4x - 8 \rightarrow y = 4(0) - 8 = -8 \rightarrow (0, -8)$
2. $2y = -5x + 10 \rightarrow y = (-5/2)x + 5 \rightarrow$ y-intercept is 5, point (0, 5)
3. The y-intercept is 7, point (0, 7)

Conclusion

Understanding how to find the y-intercept of a line like $-3x + 2y = 6$ is essential for graphing and analyzing linear relationships. By converting equations into slope-intercept form or substituting $x = 0$ directly into the original equation, you can quickly determine where the line crosses the y-axis. This knowledge not only enhances your algebra skills but also provides a foundation for solving more complex mathematical and real-world problems involving linear functions.

Frequently Asked Questions

What is the y-intercept of the line given by the equation $-3x + 2y = 6$?

The y-intercept is 3, which occurs when $x = 0$.

How do you find the y-intercept from the equation $-3x + 2y = 6$?

Set x to 0 in the equation and solve for y : $2y = 6 \rightarrow y = 3$.

What is the significance of the y-intercept in the line $-3x + 2y = 6$?

The y-intercept represents the point where the line crosses the y-axis, which is at $(0, 3)$.

Can you rewrite the equation $-3x + 2y = 6$ in slope-intercept form to find the y-intercept?

Yes. Solving for y : $2y = 3x + 6 \rightarrow y = (3/2)x + 3$. The y-intercept is 3.

What is the slope of the line given by $-3x + 2y = 6$, and what is its y-intercept?

The slope is $3/2$, and the y-intercept is 3.

If the line passes through $(0, 3)$, what does this tell us about its y-intercept?

It confirms that the y-intercept is at $y = 3$ when $x = 0$.

Is the y-intercept of $-3x + 2y = 6$ the same as the constant term when x is zero?

Yes. When $x=0$, y equals 3, which is the constant term divided by 2 in the rearranged equation.

Additional Resources

Understanding the Y-Intercept of the Line $-3x + 2y = 6$

When exploring the fundamentals of linear equations, understanding the concept of the y-intercept is essential. It provides insight into where a line crosses the y-axis, which is pivotal for graphing and analyzing linear relationships. In this detailed discussion, we'll delve into the specific line given by the equation $-3x + 2y = 6$, uncover its y-intercept, and explore related concepts and applications.

Introduction to Linear Equations and the Y-Intercept

Before diving into the specific line, it's vital to establish a clear understanding of linear equations and the significance of the y-intercept.

What Is a Linear Equation?

A linear equation in two variables (x and y) generally takes the form:

- Standard form: $Ax + By + C = 0$

or equivalently:

- Slope-intercept form: $y = mx + b$

where:

- m represents the slope of the line.
- b indicates the y-intercept, i.e., the point where the line crosses the y-axis.

The Significance of the Y-Intercept

The y-intercept is the point on the y-axis where the line intersects, characterized by the coordinate (0, b). It is crucial because:

- It serves as the initial point from which the line can be graphed.
- It helps in understanding the behavior of the line.
- It provides a starting point for plotting the line on coordinate axes.

Analyzing the Equation $-3x + 2y = 6$

Let's focus on the specific equation provided: $-3x + 2y = 6$. Our goal is to find its y-intercept.

Expressing the Equation in Slope-Intercept Form

To identify the y-intercept directly, it's easiest to rewrite the equation in the form $y = mx + b$.

Starting with:

$$-3x + 2y = 6$$

Solve for y:

1. Isolate the term with y:

$$2y = 3x + 6$$

(Note: We added $3x$ to both sides)

2. Divide both sides by 2:

$$y = (3/2)x + 3$$

Now, the equation is in slope-intercept form:

$$y = (3/2)x + 3$$

Identifying the Y-Intercept

In the form $y = mx + b$:

- The slope (m) is $3/2$
- The y-intercept (b) is 3

Therefore, the y-intercept of this line is at:

$$(0, 3)$$

This means the line crosses the y-axis at the point where y equals 3 when x is 0.

Graphical Interpretation of the Y-Intercept

Understanding the y-intercept's graphical significance helps visualize the line:

- When $x = 0$, $y = 3$.
- The point $(0, 3)$ is plotted on the y-axis.
- From this point, the slope indicates how the line progresses.

Given the slope $m = 3/2$:

- For every 2 units moved horizontally to the right (positive x-direction), the line moves upward by 3 units.
- Conversely, moving left (negative x), the line goes down by 3 units for every 2 units.

This information is useful for sketching the line accurately.

Implications of the Y-Intercept in Real-World Contexts

The y-intercept isn't just a mathematical concept; it has practical applications in various fields.

Real-World Examples of Y-Intercepts

- Economics: In cost functions, the y-intercept can represent fixed costs when production is zero.
- Physics: When analyzing motion, the y-intercept might indicate initial position at time zero.
- Business: Revenue or profit models often use y-intercepts to signify baseline levels before variables are considered.

Understanding the y-intercept helps interpret data and model real-world phenomena more effectively.

Additional Methods to Find the Y-Intercept

While rewriting the equation in slope-intercept form is straightforward, other methods exist:

Using the Standard Form

Given the original equation:

$$-3x + 2y = 6$$

Set $x = 0$:

$$-3(0) + 2y = 6$$

Simplify:

$$0 + 2y = 6$$

$$2y = 6$$

$$y = 6/2 = 3$$

Result: $(0, 3)$

This confirms our previous calculation and demonstrates an alternative approach.

Graphing Approach

- Plot the y-intercept at $(0, 3)$.
- Use the slope to find another point:
- Move 2 units right (x increases by 2).
- Move 3 units up (y increases by 3).
- Plot this second point at $(2, 6)$.
- Draw a straight line through these points to visualize the entire line.

Understanding Slope and Its Relationship to the Y-Intercept

The slope and y-intercept are interconnected in defining a line's position and inclination.

Slope (m):

- Calculated as rise over run.
- For our line: $m = 3/2$.
- Indicates the steepness and direction:
- Positive slope: line ascends from left to right.
- Negative slope: line descends from left to right.

Y-Intercept (b):

- The starting point on the y-axis.
- In our case: $y = 3$ when $x = 0$.

Combined Effect

Together, the slope and y-intercept allow you to:

- Write the equation explicitly.
- Graph the line accurately.
- Understand the line's behavior across the coordinate plane.

Practical Applications and Problem-Solving Tips

Knowing how to find and interpret the y-intercept has numerous applications.

Step-by-Step Approach for Solving Similar Problems

1. Identify the form of the equation: Standard or slope-intercept.
2. Rearrange if necessary: To slope-intercept form for quick y-intercept reading.
3. Set $x = 0$: In the standard form, to directly find y .
4. Plot the y-intercept: On the graph.
5. Use the slope: To find additional points for accurate graphing.
6. Draw the line: Connecting the points.

Common Mistakes to Avoid

- Confusing the slope with the y-intercept.
- Forgetting to set $x = 0$ when working from standard form.
- Miscalculating the intercepts due to algebraic errors.

Extending the Concept: X-Intercept and Other Features

While the focus here is on the y-intercept, it's often useful to consider the x-intercept.

Finding the X-Intercept

Set $y = 0$ in the original equation:

$$-3x + 2(0) = 6$$

$$-3x = 6$$

$$x = -6 / 3 = -2$$

So, the x-intercept is at $(-2, 0)$.

Significance of Intercepts

- Both intercepts give a complete picture of the line.
- Useful for plotting the line accurately.
- Help in understanding the line's behavior in different quadrants.

Conclusion: The Y-Intercept of $-3x + 2y = 6$

In summary:

- The line given by the equation $-3x + 2y = 6$ can be rewritten as $y = (3/2)x + 3$.
- Its y-intercept is at $(0, 3)$.
- This point indicates where the line crosses the y-axis and is fundamental for graphing and analysis.
- The slope, $3/2$, combined with the y-intercept, fully characterizes the line.
- Recognizing the intercepts allows for better visualization and understanding of the linear relationship.
- Practical applications extend across various disciplines, making the concept of intercepts crucial in both academic and real-world contexts.

By mastering how to find and interpret the y-intercept, students and professionals can better analyze linear models, solve problems efficiently, and develop a deeper understanding of algebraic relationships.

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