HELP!!! Rewrite X^2-12x=10 In Vertex Form. Please Clearly Show Your Work :)

HELP!!! Rewrite X^2-12x=10 In Vertex Form. Please Clearly Show Your Work :)

Are you struggling to convert a quadratic equation into vertex form? If so, you're not alone! Many students find rewriting quadratics in vertex form challenging at first, but with a clear step-by-step approach, you'll master it quickly. Today, we'll focus on transforming the quadratic equation $X^2 - 12x = 10$ into vertex form, showing every step to ensure you understand the process thoroughly. Whether you're preparing for a test or just want to strengthen your algebra skills, this guide will help you confidently manipulate quadratic equations.

Understanding the Vertex Form of a Quadratic Equation

Before diving into the specific problem, let's review what the vertex form of a quadratic equation is and why it's useful.

What is the Vertex Form?

The vertex form of a quadratic equation is expressed as:

$$y = a(x - h)^2 + k$$

where:
- a determines the opening direction and the width of the parabola,
- (h, k) is the vertex of the parabola.

Converting a quadratic into vertex form makes it easier to identify the vertex and graph the parabola.

Why Convert to Vertex Form?

- To find the vertex quickly.
- To analyze the parabola's properties more easily.
- To solve optimization problems.

Given Equation: X^2 - 12x = 10

Let's start with the given quadratic:

$$X^2 - 12X = 10$$

Our goal is to rewrite this in vertex form, which involves completing the square.

Step-by-Step Guide to Rewrite X^2 - 12X = 10 in Vertex Form

Step 1: Move the constant to the other side

First, rewrite the equation so that the quadratic and linear terms are on one side:

$$X^2 - 12X = 10$$

This step is already done, but it's essential for clarity.

Step 2: Complete the square on the left side

To complete the square, take the coefficient of X, which is -12, divide it by 2, and square the result.

- Coefficient of X: -12
- Divide by 2: -12 ÷ 2 = -6
- Square it: $(-6)^2 = 36$

Now, add this number (36) to both sides of the equation to maintain equality:

$$X^2 - 12X + 36 = 10 + 36$$

Simplify:

$$(X - 6)^2 = 46$$

Step 3: Write in vertex form

The left side is now a perfect square trinomial, and the right side is simplified:

$$(X - 6)^2 = 46$$

To express this as $y = a(x - h)^2 + k$, rewrite:

$$y = (X - 6)^2 - 46$$

but note that in the original form, the equation equals 10, not zero. To write in vertex form, we need to isolate y as the function of X.

Since the original equation is an expression set equal to 10, we can define:

$$y = X^2 - 12X$$

and then write:

$$y = (X - 6)^2 - 36$$

But because the original equation has $X^2 - 12X = 10$, we can write:

$$y = (X - 6)^2 - 36$$

and since the equation equals 10, then:

$$y = 10$$

which gives us the vertex form as:

$$y = (X - 6)^2 - 36$$

Alternatively, if you want to express the quadratic function Y explicitly, it would be:

$$Y = (X - 6)^2 - 36$$

Final Vertex Form of the Equation

The vertex form of the quadratic equation derived from $X^2 - 12X = 10$ is:

$$y = (X - 6)^2 - 36$$

or, in the context of the original problem:

$$X^2 - 12X = 10 \quad \Rightarrow \quad y = (X - 6)^2 - 36$$

This form shows the vertex at $(6, -36)$.

Summary of the Process

To recap, here's a simple list of steps to convert a quadratic equation into vertex form:

1. Write the quadratic in standard form: $ax^2 + bx + c$.
2. Isolate the quadratic and linear terms on one side.
3. Calculate $\left(\frac{b}{2}\right)^2$, which is the number needed to complete the square.
4. Add and subtract this number inside the equation to maintain equality.
5. Express the perfect square trinomial as $(x - h)^2$.
6. Adjust the constant term outside the square accordingly to reflect the changes.
7. Write the final equation in the form $y = a(x - h)^2 + k$.

Additional Tips for Converting Quadratic Equations

- Always perform completing the square carefully, ensuring you add and subtract the same number.
- When moving constants, keep track of signs to avoid errors.
- Practice with different coefficients to strengthen your understanding.

Practice Problem

Try converting the quadratic equation X2 + 8X + 3 = 0 into vertex form. Follow the steps outlined above and compare your results.

Conclusion

Converting quadratic equations from standard form to vertex form might seem tricky at first, but with patience and systematic steps, it becomes straightforward. Remember to complete the square carefully, keep track of constants, and always verify your work. The key takeaway from rewriting X2 - 12X = 10 is that completing the square reveals the vertex's coordinates, making the parabola's shape and position much clearer.

If you keep practicing these steps with different equations, you'll become confident in transforming and analyzing quadratic functions in no time!

Need more help? Keep practicing with different quadratic equations, and soon you'll master rewriting equations in vertex form effortlessly!

Frequently Asked Questions

How do I rewrite the quadratic equation x^2 - 12x = 10 into vertex form?

First, move the constant to the other side: x^2 - 12x = 10. Then, complete the square on the left side by adding (b/2)^2 = (12/2)^2 = 36 to both sides: x^2 - 12x + 36 = 10 + 36. Simplify: (x - 6)^2 = 46. The vertex form is (x - 6)^2 = 46.

What is the vertex form of the quadratic equation x^2 - 12x = 10?

The vertex form is (x - 6)^2 = 46, which shows the parabola's vertex at (6, 0).

Why do we complete the square when converting x^2 - 12x = 10 to vertex form?

Completing the square allows us to rewrite the quadratic in the form $(x - h)^2 + k$, which clearly shows the vertex of the parabola. It transforms the equation into a form that reveals the vertex's coordinates.

Can I convert x^2 - 12x = 10 to vertex form without completing the square?

No, completing the square is the standard method to rewrite quadratic equations into vertex form. It systematically finds the perfect square trinomial needed for this form.

What are the steps to convert x^2 - 12x = 10 into vertex form?

1. Rewrite as $x^2 - 12x = 10$. 2. Add $(12/2)^2 = 36$ to both sides: $x^2 - 12x + 36 = 10 + 36$. 3. Simplify: $(x - 6)^2 = 46$. 4. The vertex form is $(x - 6)^2 = 46$.

What is the significance of the numbers in the vertex form (x - h)^2 = k?

In the vertex form, $(x - h)^2 = k$, h represents the x-coordinate of the vertex, and k indicates the parabola's vertical shift. This form makes the vertex (h, 0) or (h, k) depending on the equation.

How do I find the vertex of the parabola from the equation x^2 - 12x = 10?

By completing the square, we find $(x - 6)^2 = 46$, so the vertex is at (6, 0). Alternatively, you can use the vertex formula: $h = -b/2a$, which gives $h = 12/2 = 6$; plug into the original to find k.

What is the importance of converting to vertex form in quadratic equations?

Converting to vertex form helps identify the vertex's location, understand the parabola's shape and position, and makes graphing easier.

Can I verify the conversion by expanding the vertex form back to standard form?

Yes, expanding $(x - 6)^2 = 46$ gives $x^2 - 12x + 36 = 46$, which simplifies to $x^2 - 12x = 10$, confirming the conversion is correct.

Additional Resources

HELP!!! Rewrite X^2 - 12x = 10 in Vertex Form — A Step-by-Step Guide to Mastering Quadratic Transformation

Mathematics often presents students with challenging problems that require a deep understanding of algebraic concepts. Among these, converting quadratic equations from standard form to vertex form is a fundamental skill, especially for analyzing the graph's shape and identifying key features like the vertex, axis of symmetry, and direction of opening. In this comprehensive article, we will meticulously explore how to rewrite the quadratic equation $x^2 - 12x = 10$ into vertex form. We aim to clarify each step, provide detailed explanations, and foster a thorough understanding of the process.

Understanding the Context: Why Convert to Vertex Form?

Before diving into the transformation process, it's essential to grasp why rewriting quadratics in vertex form is important.

The Significance of Vertex Form

Quadratic equations can be expressed in several forms, primarily:

- Standard form: $y = ax^2 + bx + c$
- Vertex form: $y = a(x - h)^2 + k$

The vertex form is particularly valuable because it directly reveals the parabola's vertex (h, k), which is the highest or lowest point on the graph depending on the parabola's orientation. Recognizing the vertex helps in graphing, analyzing the parabola's properties, and solving real-world problems involving maximums and minimums.

The Challenge with Standard Form

While the standard form is straightforward for polynomial operations, it doesn't explicitly display the vertex. Converting to vertex form involves a process called completing the square, which re-expresses the quadratic in a form that clearly shows the vertex's coordinates.

Step-by-Step Breakdown of the Conversion Process

Our goal is to convert:

$$
x^2 - 12x = 10
$$

into the form:

$$
y = a(x - h)^2 + k
$$

where $a = 1$ (since the coefficient of x^2 is 1), and (h, k) are the vertex coordinates.

Step 1: Bring All Terms to One Side

Initially, the equation is:

$$
x^2 - 12x = 10
$$

For completing the square, it’s best to work with zero on one side:

$$
x^2 - 12x - 10 = 0
$$

However, since our aim is to express the quadratic in vertex form, we can keep the right side as 10 for now and focus on rewriting the left side:

$$
x^2 - 12x = 10
$$

Step 2: Complete the Square on the Left Side

Completing the square involves creating a perfect square trinomial from the quadratic expression $x^2 - 12x$. The general process is:

- Take half of the coefficient of x, which is -12.
- Square that value.
- Add and subtract this square within the expression to maintain equality.

Calculations:

- Half of -12 is -6.
- Squaring -6 yields 36.

Thus, we rewrite the left side as:

$$
x^2 - 12x + 36 - 36 = 10
$$

which simplifies to:

$$
(x^2 - 12x + 36) - 36 = 10
$$

Now, recognize that:

$$
x^2 - 12x + 36 = (x - 6)^2
$$

Therefore, the equation becomes:

$$
(x - 6)^2 - 36 = 10
$$

Step 3: Isolate the Vertex Form

Add 36 to both sides to isolate the perfect square:

$$
(x - 6)^2 = 10 + 36
$$

which simplifies to:

$$
(x - 6)^2 = 46
$$

Rearranged, the equation in vertex form is:

$$
y = (x - 6)^2 + c
$$

But since we started with $x^2 - 12x = 10$, and the goal is to express as a function $y = \ldots$, we can write:

$$
y = (x - 6)^2 + \text{(constant)}
$$

From the previous step, note that the original form was:

$$
x^2 - 12x = 10
$$

which can be rewritten as:

$$
y = x^2 - 12x
$$

and adding the constant term to complete the square:

$$
y = (x - 6)^2 - 36
$$

since:

$$
(x - 6)^2 = x^2 - 12x + 36
$$

and subtracting 36 gives us the original quadratic $x^2 - 12x$.

Now, considering the original equation:

$$
x^2 - 12x = 10
$$

we can interpret this as:

$$
y = x^2 - 12x
$$

and the entire quadratic in terms of y is:

$$
y = (x - 6)^2 - 36
$$

To express the entire relation in vertex form, explicitly including the constant:

$$
y = (x - 6)^2 - 36
$$

which is the vertex form of the quadratic.

Interpreting the Vertex Form

The vertex form:

$$
y = (x - h)^2 + k
$$

reveals several key features:

- Vertex: (h, k)
- Axis of symmetry: $x = h$
- Direction of opening: Since the coefficient of the squared term is positive (1), the parabola opens

upward.

In our case:

$$
\boxed{
y = (x - 6)^2 - 36
}
$$

- The vertex is at $(6, -36)$.
- The axis of symmetry is $x = 6$.
- The parabola opens upward.

Visualizing the Transformation

Understanding the geometric interpretation enhances comprehension:

- The original quadratic $y = x^2 - 12x$ is a parabola opening upward.
- Completing the square shifts the parabola horizontally to the right by 6 units and vertically downward by 36 units.
- The vertex at $(6, -36)$ represents the minimum point of the parabola, which corresponds to the vertex in the vertex form.

Why Is This Conversion Useful?

Converting to vertex form isn’t just an algebraic exercise; it has practical applications:

- Graphing: Clearly identifies the parabola’s vertex and symmetry, simplifying plotting.
- Optimization problems: Easily find maximum or minimum values.
- Solving equations: Helps in solving quadratic inequalities or equations by analyzing the vertex.
- Real-world modeling: In physics, economics, and engineering, the vertex often signifies optimal points.

Additional Insights and Tips for Mastery

Summarizing the Complete Process

1. Start with the quadratic in standard form or an equation set equal to a constant.
2. Isolate the quadratic and linear terms.
3. Find half of the coefficient of x, square it, and add/subtract to complete the square.
4. Rewrite the quadratic as a perfect square trinomial.
5. Simplify to express as a vertex form.

Common Mistakes to Avoid

- Forgetting to balance the equation: Always add and subtract the same value when completing the square.
- Misidentifying the vertex: Remember, the vertex is at (h, k) where h is derived from the completed square form.
- Confusing signs: Pay close attention to signs when completing the square and rewriting.

Practice Problems

To solidify understanding, try converting these quadratics:

- $y = 2x^2 + 8x + 5$
- $y = -x^2 + 4x - 7$
- $y = x^2 - 6x$

Conclusion: Mastering the Transformation

Transforming the quadratic $x^2 - 12x = 10$ into vertex form exemplifies a fundamental algebraic skill — completing the square. This process not only simplifies the equation but also unveils the parabola's geometric features, empowering students to analyze and graph quadratic functions effectively. Through a step-by-step approach, understanding each algebraic manipulation, and recognizing the importance of the vertex, learners can confidently navigate quadratic transformations. Whether for academic purposes or real-world applications, mastering this skill enhances mathematical literacy and problem-solving capabilities.

Remember, practice makes perfect. The more you work through such conversions, the more intuitive they become, laying a solid foundation for advanced algebra and calculus topics. So, keep practicing, stay curious, and embrace the elegance of quadratic transformations!

Help Rewrite X 2 12x 10 In Vertex Form Please Clearly Show Your Work

Help Rewrite X 2 12x 10 In Vertex Form Please Clearly Show Your Work

Related Articles

- How Doe Saeng Feel About The Clothe He I Wearing Before The Tet In Winter Hibicu
- The Selection Pointer Is The Blinking Vertical Line In The Document Window. T/F
- Select The Event Most Associated With The Occurrence Of Dissociative Fugue.