

Name: _____

Date: _____ # _____

Section 4-6 Completing the Square

Learning Goal: To understand how to solve quadratic equations by completing the square.
To understand how to rewrite functions by completing the square.

Essential Questions: What are the advantages of a quadratic function in vertex form?
What are the advantages of a quadratic function in standard form?
How is any quadratic function related to the parent function of $y = x^2$?
How are the real solutions of a quadratic equation related to the graph of the related quadratic function?

Warm Up:

Factor each expression.

1. $16x^2 - 1$

2. $5x^2 - 26x + 5$

3. $2x^2 + 13x - 7$

Without graphing, identify the vertex, axis of symmetry, and transformations from the parent function $f(x) = |x|$.

4. $y = |x + 9| + 4$

5. $y = |2x - 7|$

6. $y = \frac{3}{4}|x| - 1$

Simplify the expression.

7. $(x + 4)(x + 4) - 3$

8. $(2x - 1)(2x - 1)$

9. $(x - 3)(x - 3)$

Vocabulary:**Square Root-** The product of a number times itself

Square roots:

$\sqrt{1} = 1$	$\sqrt{4} = 2$	$\sqrt{9} = 3$	$\sqrt{16} = 4$	$\sqrt{25} = 5$	$\sqrt{36} = 6$	$\sqrt{49} = 7$	$\sqrt{64} = 8$	$\sqrt{81} = 9$	$\sqrt{100} = 10$
$\sqrt{121} = 11$	$\sqrt{144} = 12$	$\sqrt{169} = 13$	$\sqrt{196} = 14$	$\sqrt{225} = 15$	$\sqrt{256} = 16$	$\sqrt{289} = 17$	$\sqrt{324} = 18$	$\sqrt{361} = 19$	$\sqrt{400} = 20$

You Try:

1. $4x^2 + 10 = 46$

2. $7x^2 - 10 = 25$

3. $2x^2 + 9 = 13$

4. $3x^2 + 5 = 20$

5. $8x^2 - 3 = 29$

6. You are painting a large wall mural. The wall length is 3 times the height. The area of the wall is 300 ft². What are the dimensions of the wall? If each can of paint covers 22 ft², will 12 cans be enough to cover the wall?

7. The lengths of the sides of a carpet have the ratio of 4.4 to 1. The area of the carpet is 1154.7 ft². What are the dimensions of the carpet?

Sometimes an equation shows a perfect square trinomial equal to a constant. To solve, factor the perfect square trinomial into the square of a binomial. Then find the square roots.

Perfect Square Trinomial:

You Try:

8. $x^2 - 14x + 49 = 25$

9. $x^2 + 12x + 36 = 9$

10. $9x^2 - 12x + 4 = 49$

11. $4x^2 + 36x + 81 = 16$

12. $x^2 + 2x + 1 = 36$

13. $(x - 7)^2 = 81$

Completing the Square -

- Rewrite the equation in the form $x^2 + bx = c$. To do this, get all terms with the variable on one side of the equation and the constant on the other side. Divide all the terms of the equation by the coefficient of x^2 if it is not 1.
- Complete the square by adding $\left(\frac{b}{2}\right)^2$ to each side of the equation.
- Factor the trinomial
- Find the square roots.
- Solve for x.

Try Some:

What value completes the square for:

14. $x^2 + 14x$

15. $x^2 + 6x$

16. $x^2 + 38x$

Solve the following equations by completing the square.

17. $x^2 - 8x - 5 = 0$

18. $x^2 - 10x = -11$

19. $2x^2 + 11x - 23 = -x + 3$

20. $x^2 - 18x + 64 = 0$

21. $3x^2 - 42x + 78 = 0$

22. $3x^2 + 18x - 3 = 0$

Writing in Vertex Form:

Rewrite each equation in vertex form. Name the vertex and y-intercept.

23. $y = x^2 + 10x - 9$

24. $y = x^2 - 18x + 13$

25. $y = x^2 + 32x - 8$

Closure: How does completing the square help solve any quadratic equation?
