

Completing the Square

Date: _____ Hr: _____

Objective:

- To solve equations by completing the square
- To rewrite functions by completing the square

Common Core Content Standard:

Reviews A.REI.4.b. Solve quadratic equations by Completing the square....

Completing a perfect square trinomial allows you to factor the completed trinomial as the square of a binomial.

You can solve an equation that contains a perfect square by finding square roots. The simplest of this type of equation has the form $ax^2 = c$.

Example 1: Solving by Finding Square Roots

What is the solution of each quadratic equation?

a.) $3x^2 + 5 = 20$?

b.) $8x^2 - 3 = 29$

Example 2: Determining Dimensions

The total area of three congruent circles is 500 cm^2 . Find the approximate radius of each circle.

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.

Example 3: Solving a Perfect Square Trinomial Equation

What is the solution of $x^2 + 12x + 36 = 9$?

If $x^2 + bx$ is not part of a perfect square trinomial, you can use the coefficient b to find a constant c so that $x^2 + bx + c$ is a perfect square. When you do this, you are _____.

Take note

Key Concept Completing the Square

You can form a perfect square trinomial from $x^2 + bx$ by adding $(\frac{b}{2})^2$.

$$x^2 + bx + (\frac{b}{2})^2 = (x + \frac{b}{2})^2$$

Example 4: Completing the Square

What value completes the square for $x^2 + 14x$?

Take note

Key Concept Solving an Equation by Completing the Square

1. 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.
2. Complete the square by adding $(\frac{b}{2})^2$ to each side of the equation.
3. Factor the trinomial.
4. Find square roots.
5. Solve for x .

Example 5: Solving by Completing the Square

What is the solution of $3x^2 + 18x - 3 = 0$?

You can complete a square to change a quadratic function to vertex form.

Example 6: Writing in Vertex Form

What is $y = x^2 - 10x + 4$ in vertex form? Name the vertex and y-intercept.