9.1 The Square Root Property and Completing the Square

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- **Review the Zero-Factor property.**
- **Learn the Square Root Property**
- **Solve quadratic equations of the form $(ax + b)^2 = c$ by extending the square root property.**
- **Solve quadratic equations by completing the square.**
- **Solve quadratic equations with solutions that are not real numbers.**

Review from Chapter 6

Quadratic Equation

An equation that can be written in the form

where $a, b,$ and c are real numbers with $a \neq 0$, is a _____. The given form is called _____.

Zero Factor Property

If two numbers have a product of 0, then at least one of the numbers must be 0. That is, if

Example 1

Solve $3x^2 - 5x - 28 = 0$ by using the zero-factor property.

Square Root Property

Square Root Property

If x and k are complex numbers and $x^2 = k$, then

Example 2

Solve each equation.

a) $x^2 = 12$

b) $3x^2 - 8 = 88$

Example 3

Solve.

$$y^2 + 24 = 0$$

Example 4

Galileo developed a formula for freely falling objects described by

$$d = 16t^2$$

Where d is the distance in feet than an object falls in t seconds, regardless of weight. Galileo dropped objects from the Leaning Tower of Pisa to develop this formula. If the Leaning Tower of Pisa is about 180 feet tall, how long would it take an object to fall to the ground?

Example 5

Solve.

$$(x-3)^2 = 16$$

Example 6

Solve.

$$(p-4)^2 = 3$$

Example 7

Solve.

$$(x + 4)^2 = -36$$

More Review

Factor.

$$x^2 + 6x + 9$$

$$y^2 - 16y + 64$$

Example 8

What constant must be added to get a perfect square trinomial?

- $x^2 + 4x + \_\_\_\_\_$
- $y^2 - 2y + \_\_\_\_\_$
- $m^2 + 5m + \_\_\_\_\_$

Example 9

Solve.

$$x^2 + 8x + 10 = 0$$

Completing the Square

- **Be sure the second-degree term has a coefficient of 1.**
- **Write the equation in the correct form.** *(Variables on one side, constant on the other.)*
- **Complete the square.** *(Find the magic number)*
  - ***Take the coefficient of the 1st degree term and divide by 2.***
  - ***Square this answer.***
  - ***Add the answer to both sides of the equation.***
  - ***Factor variable side, simplify constant side.***
- **Solve the equation using the square root property.**

Example 10

Solve.

$$x^2 + 4x = 1$$

Example 11

Solve.

$$x^2 + 3x - 1 = 0$$

Example 12

Solve.

$$3x^2 + 6x - 2 = 0$$

Example 13

Solve.

$$x^2 + 2x + 7 = 0$$