Algebra II **Section 5.5**
Auch **Date:**

Objectives

- Solve quadratic equations with complex roots.
- Define and use imaginary and complex numbers.

Vocabulary

Imaginary unit –
Imaginary number –
Complex number –
Real Part –
Imaginary part –
Complex conjugate -

Imaginary Numbers		
Words	**Numbers**	**Algebra**
An imaginary number is the square root of a negative number. **Imaginary numbers ban be written in the form bi, where b is a real number and I is the imaginary unit.** **The square of an imaginary number is the original negative number.**	$\sqrt{-1} = i$ $\sqrt{-2} = \sqrt{-1}\sqrt{2} = i\sqrt{2}$ $\sqrt{-4} = \sqrt{-1}\sqrt{4} = 2i$ $\left(\sqrt{-1}\right)^2 = i^2 = -1$	**If b is a positive real number,** **then** $\sqrt{-b} = i\sqrt{b}$ **and** $\sqrt{-b^2} = bi.$ $\left(\sqrt{-b}\right)^2 = -b.$

Example 1

Simplifying Square Roots of Negative Numbers

Express each number in terms of *i*..

a) $3\sqrt{-16}$

$3\sqrt{(16)(-1)}$	Factor out -1.
$3\sqrt{(16)}\sqrt{-1}$	Product Property
$3 \cdot 4\sqrt{-1}$	Simplify
$12\sqrt{-1}$	Multiply
$12i$	Express in terms of *i.*

b) $-\sqrt{-75}$

Try it!

a) $\sqrt{-12}$

b) $2\sqrt{-36}$

c) $-\frac{1}{3}\sqrt{-63}$

Example 2 **Solving a Quadratic Equation with Imaginary Solutions**

Solve each equation.

a) $x^2 = -81$

b) $3x^2 + 75 = 0$

Try it!

Solve each equation.

a) $x^2 = -36$

b) $x^2 + 48 = 0$

c) $9x^2 + 25 = 0$

Example 3 **Finding Complex Zeros of Quadratic Functions**

Find the zeros of each function.

a) $f(x) = x^2 - 2x + 5$

$x^2 - 2x + 5 = 0$	Set equal to zero
$x^2 - 2x + ? = -5 + ?$	Rewrite
$x^2 - 2x + 1 = -5 + 1$	Add $\left(\frac{b}{2}\right)^2$
$(x-1)^2 = -4$	Factor
$x - 1 = \pm\sqrt{-4}$	Take square roots.
$x = 1 \pm 2i$	Simplify.

b) $g(x) = x^2 + 10x + 35$

Try it! **Finding Complex Zeros of Quadratic Functions**

Find the zeros of each function.

a) $f(x) = x^2 + 4x + 13$

b) $g(x) = x^2 - 8x + 18$

Example 4 **Finding Complex Conjugates**
Find each complex conjugate.

a) $2i - 15$
$-15 + 2i$ Write as $a+bi$
$-15 - 2i$ Find $a-bi$

b) $-4i$

Try it! **Finding Complex Conjugates**
Find each complex conjugate.

a) $9 - i$

b) $i + \sqrt{3}$

c) $-8i$