## TOPIC: INTRO TO COMPLEX NUMBERS

### Square Roots of Negative Numbers

◆ Recall: Square roots of positive numbers are ***real***, but square roots of negative numbers are ***not real***.

$\sqrt{4}$ $\qquad\qquad$ $\sqrt{-1}$

► We came up with the letter $\boldsymbol{i}$ to express this: $\boldsymbol{i} =$ _____

*The Imaginary Unit*

◆ **Factor** to separate the **negative** in the square root.

EXAMPLE: Simplify the given square root.

$\sqrt{-4}$

$\sqrt{-b} =$ _____ $=$ _____ $=$ _____

*$b$ is a positive, real number.

EXAMPLE: Add or subtract the expressions and simplify.

$(\boldsymbol{A})$ $\sqrt{-17}$

$(\boldsymbol{B})$ $\sqrt{-32}$

_____# ____ _____

**Note:** Because all of these solutions include the imaginary unit, they are called ***imaginary numbers***.

**PRACTICE** Simplify the given square root. $\sqrt{-75}$

## TOPIC: INTRO TO COMPLEX NUMBERS

### Introduction to Complex Numbers

◆ Recall: We've learned *real & imaginary numbers* separately, but you'll see expressions with *both* types of numbers.

► We call these **complex numbers**, which have a **standard form** of:

$$a + bi$$

$a$ is the _____ part  $b$ is the _____ part

EXAMPLE: Identify the real and imaginary parts of each complex number.

**COMPLEX NUMBERS**

$(A)$ $4 - 3i$

$a =$ _____ $b =$ _____

$(B)$ $0 + 7i$

$a =$ _____ $b =$ _____

$(C)$ $2 + 0i$

$a =$ _____ $b =$ _____

**PRACTICE** Identify the real and imaginary parts of the complex number.

$(A)$ $4 - 9i$

$a =$ _____ $b =$ _____

$(B)$ $3 + 2i\sqrt{3}$

$a =$ _____ $b =$ _____

**PRACTICE** Write the complex number in standard form.

$$\frac{9 + \sqrt{-16}}{3}$$

## TOPIC: INTRO TO COMPLEX NUMBERS

### Adding & Subtracting Complex Numbers

◆ Just like with algebraic expressions, when you add or subtract complex #s, simply **combine like terms**.

► Always express your answer in _____ form!

**Adding/Subtracting Algebraic Expressions**

$(4 + 8x) + (2 + 3x)$

$4 + 8x + 2 + 3x$

$6 \quad + \quad 11x$

EXAMPLE: Perform the given operation, expressing the result in standard form.

**ADDING COMPLEX NUMBERS**

$(4 + 8i) + (2 + 3i)$

**SUBTRACTING COMPLEX NUMBERS**

$(4 + 8i) - (2 + 3i)$

**PRACTICE** Find the sum or difference. Express your answer in standard form.

$(A)$ $(2 + 8i) - (4 - i)$

$(B)$ $5(4 + 7i) + 6(3 - 2i)$