

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**.

$$\sqrt{4}$$

$$\sqrt{-1}$$

- We came up with the letter ***i*** to express this: ***i*** = _____

The Imaginary Unit

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

EXAMPLE: Simplify the given square root.

$$\sqrt{-4}$$

$$\sqrt{-b} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

**b* is a positive, real number.

EXAMPLE: Add or subtract the expressions and simplify.

(A) $\sqrt{-17}$

(B) $\sqrt{-32}$

_____ # _____

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

PRACTICE

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

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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)

$$4 - 3i$$

$$a = \underline{\hspace{1cm}} \quad b = \underline{\hspace{1cm}}$$

(B)

$$0 + 7i$$

$$a = \underline{\hspace{1cm}} \quad b = \underline{\hspace{1cm}}$$

(C)

$$2 + 0i$$

$$a = \underline{\hspace{1cm}} \quad b = \underline{\hspace{1cm}}$$

PRACTICE

Identify the real and imaginary parts of the complex number.

(A)

$$4 - 9i$$

$$a = \underline{\hspace{1cm}} \quad b = \underline{\hspace{1cm}}$$

(B)

$$3 + 2i\sqrt{3}$$

$$a = \underline{\hspace{1cm}} \quad b = \underline{\hspace{1cm}}$$

PRACTICE

Write the complex number in standard form.

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

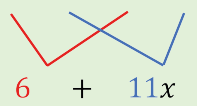
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Adding & Subtracting Complex Numbers

◆ 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

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

$$6 + 11x$$

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