

Warm -Up

Simplify

$$1) (9 + \sqrt{6})(-8 + \sqrt{6})$$

$$2) \frac{5}{3 - \sqrt{2}}$$

Evaluate

$$3) f(x) = \sqrt{7 - 3x} \quad f(5)$$

Objective:

Today we will:

- Review Radical properties
- Add, Subtract, and Multiply Complex numbers
- Simplify rational expressions with complex numbers

Agenda:

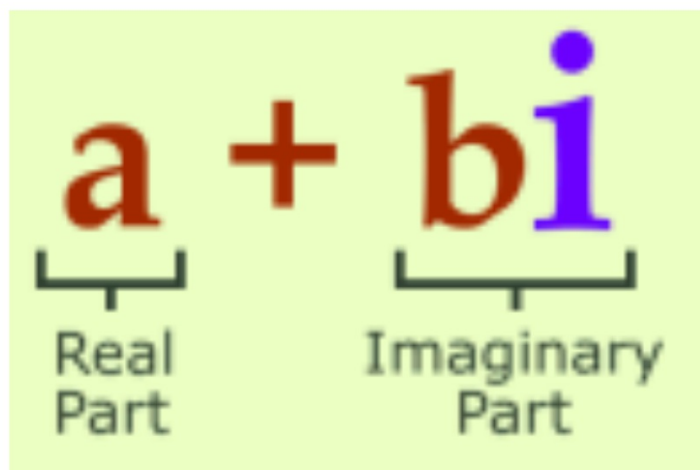
- Policy Review
- Radical Bingo
- Complex Number notes and examples
- Hand back tests
- Independent practice

Upcoming Dates

- Quiz Tuesday (2/16)
- Unit 1 Test- Monday (2/22)

Complex Numbers

Combination of Real and Imaginary numbers



$$7 + 3i$$

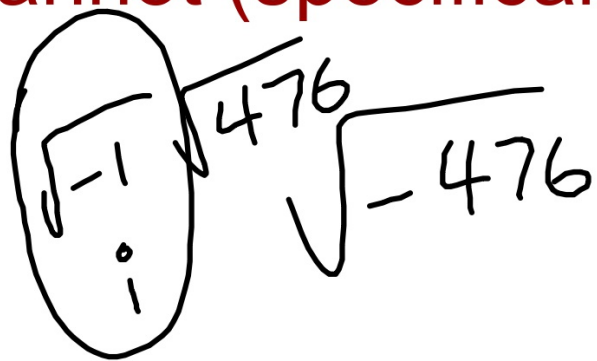
Imaginary Numbers

Definition: $i = \sqrt{-1}$

$$i^2 = -1$$

A little about Imaginary Numbers

- First used in the 16th century
- Rene Descartes called them imaginary as a derogatory term
- Allow us to solve problems that real numbers cannot (specifically polynomials)



Uses of Imaginary Numbers

- Engineering: Stress and Resonance
- Flow of fluid around objects
- Electric Circuits and Radio Waves
- Infinite Series

Adding and Subtracting Complex

Ex. 1 $(5 + 8i) + (2 + i)$

$$7 + 9i$$

Ex. 2 $(-4 - 8i) - (-1 + 4i)$

$$-4 - 8i + 1 - 4i$$
$$-3 - 12i$$

Ex. 3

$$(-3 + 8i) + (4 + 8i) - (-6 - 5i)$$

$$7 + 21i$$

$$7(1 + 3i)$$

Multiplying Complex Numbers

- Same steps as real numbers
- Turn i^2 into -1

Ex. 1

$$(-7i)(-5 + 5i)$$

$$35 + 35i$$

$$35i - 35i^2$$
$$35i - 35(-1)$$

Ex. 2 $(5 - 2i)(-7 - i)$

$$-35 - 5i + 14i + 2i^2$$

$$-35 + 9i - 2$$

$$\boxed{-37 + 9i}$$

Ex. 3 - You try

$$(4 + 5i)^2$$

$$(4+5i)(4+5i)$$

$$16 + 20i + 20i + 25i^2$$

$$16 + 40i - 25$$

$$-9 + 40i$$

Ex. 4 $(5i)(-i)(1 - 4i)$

$$-5i^2 (1 - 4i)$$

$$5(1 - 4i)$$

$$5 - 20i$$

Rationals with complex numbers

- Cannot leave i in the denominator
- Use the conjugate to rationalize denominator

Ex. 1 $\frac{6i}{5+2i} \frac{(5-2i)}{(5-2i)}$

$$\frac{30i - 12i^2}{25 - \cancel{10i} + \cancel{10i} - 4i^2}$$

$$\frac{12 + 30i}{29}$$

Ex. 2

$$\frac{6 + 7i}{-3 - 10i} \frac{(-3 + 10i)}{(-3 + 10i)}$$

$$-18 + 60i - 21i + 70i^2$$

$$\hline 9 - \cancel{30i} + \cancel{30i} - 100i^2$$

$$\hline -88 + 39i$$

$$109$$

Ex. 3

$$\frac{-4 + 3i}{-8i} \cdot \frac{i}{i}$$

$$\frac{-4i + 3i^2}{-8i^2}$$

$$\frac{-3 - 4i}{8}$$

Simplifying Negative Radicals

- Separate out $\sqrt{-1}$
- Turn $\sqrt{-1}$ into i
- Simplify remaining radical as usual

Ex. 1 $\sqrt{-25}$ $\sqrt{-1} \sqrt{25}$
 $5i$

Ex. 2 $\sqrt{-27}$ $\sqrt{-1} \sqrt{27}$
 $i\sqrt{9} \sqrt{3}$
 $3i\sqrt{3}$

Ex. 3 $-12\sqrt{-96}$

$$-48i\sqrt{6}$$

Ex. 4 - You Try

$$-6i\sqrt{-54}$$

$$-48i\sqrt{6}$$

Wrap - Up

Why are there imaginary numbers?

What is the definition of i ?

When must complex numbers be applied to radical expressions?

Tuesday's Quiz

What's on it?

- Simplifying single number radicals
- +, -, x radicals
- Rationalizing the denominator
- All complex numbers from today

What's not?

- Higher index radicals
- Variables under radical

On Test

Tonight's HW

- Homework #7
- Study for Quiz

$$1) \frac{9i}{2 - 3i}$$

$$2) \sqrt[7]{-125}$$

