

CC Algebra 2 - Regents Review

Unit #9: Complex Numbers

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Based on Kirk Weiler's
emathinstruction lessons

Unit 9 Video Overview

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- CCLS Associated with Unit 9
- Basics of Complex Numbers
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Unit 9: Lesson Overview

- 9.1 Imaginary Numbers
- 9.2 Complex Numbers
- 9.3 Solving Quadratic Equations with Complex Solutions
- 9.4 The Discriminant of a Quadratic

CCLS Associated with Unit 9

- ❖ N.CN.1 – Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
- ❖ N.CN.2 – Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
- ❖ N.CN.7 – Solve quadratic equations with real coefficients that have complex solutions.
- ❖ A.REI.4 – Solve quadratic equations in one variable.

Basics of Complex Numbers

- ❖ Definition of an Imaginary Number:
- ❖ Every Complex Number has two parts.
- ❖ Conjugate of a Complex Number.
- ❖ Operations with Complex Numbers:

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

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

Powers of i

Completely simplify the following expressions and write your answer as a complex number.

$$i^{63}$$

$$i^{185}$$

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

$$8i^6 + 6i^5 - 5i^3 - 3i^2 - 7i - 9$$

Rationalizing Denominators

A completely reduced answer should never have a radical in the denominator.

Completely simplify the following expressions by rationalizing the denominators.

$$\frac{15}{4 + \sqrt{6}}$$

$$i^{-15}$$

$$\frac{4 - 4i}{2 + 2i}$$

$$\frac{5}{1 + \sqrt{-9}}$$

The Discriminant

Use the Discriminant to determine the nature of the roots of a Quadratic.

Determine the nature of the roots of the following quadratic functions.

$$y = x^2 + 6x + 9$$

$$y = 4x^2 + 4x - 5$$

$$y = 2x^2 + 6x + 7$$

Solving Quadratic Equations Involving Complex Numbers

Apply the Quadratic Formula to solve the following quadratic equation.

$$2x^2 - 4x + 5 = 0$$

Summary of Most Important Information

- ❖ Students should be able to:
 - ❖ Know that a complex number has a real part and an imaginary part.
 - ❖ Add, subtract, multiply, and divide complex numbers and write your answer as a complex number in simplest form.
 - ❖ Apply the powers of i to reduce an expression into complex form.
 - ❖ Know that complex numbers come in conjugate pairs when solving equations.
 - ❖ Apply the discriminant to determine the number and nature of the roots of a quadratic equation.
 - ❖ Rationalize the denominator.