Lesson # 24: Complex Numbers (5.9)

By the end of the lesson, we will be able to:

~ Simplify Imaginary and Complex Numbers.

Lesson # 24: Complex Numbers (5.9)

We already know that the square root of a negative number is not a real number. This is because there is no real number that satisfies the equation $x^2 = -1$.

However, about 400 years ago, a French mathematician named René Descartes suggested that a new number be invented, an imaginary number, represented by the letter i, which is the solution to that equation.

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Definition of i: $\sqrt{-1} = i$ and $i^2 = -1$

Expanding the set of numbers to include *imaginary numbers* allows us to simplify expressions and solve equations that were not possible using only real numbers.

Whenever you see a negative number under a radical, take it out of the radical and write it as an i on the outside.

Examples: Simplify each expression.

Remember to remove the i's first.

a.) $\sqrt{-81}$

b.) $\sqrt{-121x^5}$

Examples: Simplify each expression.

Remember to remove the i's first.

c.) $\sqrt{-8n^2}$

d.) $\sqrt[3]{-64x^4}$

Examples: Simplify each expression.

Remember to remove the i's first.

e.) $\sqrt{-\frac{25}{121}}$

f.) $\sqrt{-\frac{252}{4}}$

Examples: Simplify each expression.

Remember to remove the i's first.

g.) $\sqrt{-5} \cdot \sqrt{-20}$

h.) $\left(-3\sqrt{-5}\right)^2$

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What is the pattern in the powers of i?

$i^0 =$	$i^9 =$
$i^1 = i$	$i^{10} =$
$i^2 = -1$	$i^{11} =$
$i^3 =$	$i^{12} =$
$i^4 =$	$i^{20} =$
$i^5 =$	$i^{25} =$
$i^6 =$	$i^{82} =$
$i^7 =$	$i^{103} =$
$i^8 =$	$i^{400} =$

Since the pattern repeates every 4, we should

- Divide the power on the "i" by 4.
- The remainder will tell us which of the 1st 4 it is like.

$i^0 =$

$i^1 = i$

$i^2 = -1$

$i^3 =$

Memorize!

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A ***complex number*** is an expression of the form $a + bi$, which means it has a real part (a) and an imaginary part (bi). When simplifying expressions with complex numbers is similar to simplifying polynomials, but wherever there is an i^2, change it to -1.

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

a.) $3i \cdot 6i^2$

b.) $(2i \cdot 3i)^2$

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

c.) $3(-5-2i)+2(-3+2i)$

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

d.) $(7+5i)+(-4-6i)$

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

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

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

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

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

g.) $(7 - i)(4 + 2i)(5 + 2i)$

Examples: Simplify each expression.

Remember to remove the i's and $i^2 = -1$.

h.) $\left(\sqrt{5} + 2i\right)^2$

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By the end of the lesson, we will be able to:

~ Simplify Imaginary and Complex Numbers.

Can you?

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Homework:

Assignment #24