

4.6: Conjugates and Complex Numbers

“I WILL ...

Understand how to convert conjugates.”

I. Rule: No radicals are allowed in the denominator

II. The Conjugate

- A. Rule: No _____ in the denominator
- B. _____ is the complex number’s opposite sign
- C. When we multiply a compound equation with a radical, we must multiply the OPPOSITE to get rid of the radical to both the _____ (TOP) and _____ (BOTTOM)
- D. Multiply the bases and radicals together

III. Imaginary Numbers

- A. _____ are numbers that can be written as a real number times “*i*.”
- B. **View the radical without the negative** and simplify it
- C. After simplified form, **attach an “*i*”** onto the real number
- D. **Simplify** further, if needed

IV. Complex Numbers

- A. Complex Numbers are numbers that are associated with a second real number with an ordered pair,
- B. $a + bi$; $a =$ _____; $b =$ _____
- C. _____ is the complex number’s opposite sign
 - a. Example: $2 + 3i$ ’s conjugate is $2 - 3i$
- D. Remember: _____ in the denominator

SIMPLIFY RADICALS FIRST then OPERATE

V. Rules with Imaginary Numbers

- A. *Rules with Imaginaries:*
 - A. $i^1 = i$
 - B. $i^2 = -1$
- B. Answers CAN have an *i* but CANNOT have two *i*’s
- C. Two *i*’s make -1
- D. Rule of 4
 - A. Look at the exponent of the imaginary number and divide by 4
 - B. View only the remainder or decimal
 - C. Convert the problem with the number

Imaginary Power	Remainder	Decimal (in calc)	Imaginary Number
i^1			
i^2			
i^3			
i^4			

VI. Model Problems

Ex 1: Rationalize $\frac{1}{\sqrt{3}}$		Ex 2: Rationalize $\frac{2}{\sqrt{5}}$	
Ex 3: Rationalize $\frac{2\sqrt{16}}{\sqrt{9x}}$		Your Turn: Rationalize $\frac{3\sqrt{25}}{\sqrt{4x}}$	
Ex 4: Rationalize $\frac{1}{\sqrt[3]{7}}$		Your Turn: Rationalize $\sqrt[3]{\frac{2}{9}}$	
Ex 5: Rationalize $\frac{1}{4+\sqrt{3}}$		Ex 6: Rationalize $\frac{1}{\sqrt{5}-2}$	
Ex 7: Rationalize $\frac{\sqrt{32}}{\sqrt{2}+\sqrt{5}}$		Your Turn: Rationalize $\frac{3\sqrt{x}}{2\sqrt{x}+\sqrt{y}}$	
Ex 8: Simplify, $\sqrt{-4}$	Ex 9: Simplify, $\sqrt{-11}$	Ex 10: Simplify, $3\sqrt{-20}$	Your Turn: Simplify, $-2\sqrt{-75}$

Ex 11: Multiply $(i\sqrt{3})^2$	Ex 12: Multiply $(4i)^2$	Your Turn: Multiply $(5i\sqrt{2})^2$
Ex 13: Multiply $\sqrt{-6} \cdot \sqrt{-6}$	Ex 14: Multiply $\sqrt{-3} \cdot 2\sqrt{-5}$	Your Turn: Multiply $\sqrt{-4x} \cdot \sqrt{-16x^3}$
Ex 15: Solve the equation, $x^2 = 144$	Ex 16: Solve the equation, $5x^2 + 90 = 0$	Your Turn: Solve the equation, $9x^2 + 25 = 0$
Ex 17: Find the values of x and y that make the equation $4x + 10i = 2 - (4y)i$ true.	Ex 18: Find the values of x and y that make the equation $2x - 6i = -8 + (20y)i$ true.	Your Turn: Find the values of x and y that make the equation $-8 + (6y)i = 5x - i\sqrt{6}$ true.
Ex 19: Simplify i^7	Ex 20: Simplify i^{25}	Your Turn: Simplify i^{5892}
Ex 21: Simplify $i^{25} + i^{36}$	Your Turn: Simplify $i^{21} + i^{30}$	