Algebra 2 4.4

Perform operations with imaginary numbers

Perform operations with complex numbers

radical

simplify by "casting out pairs"

square root property

real number

imaginary unit $\sqrt{-1} = i$

* pure imaginary numbers

complex numbers

complex conjugate

$i \cdot i \cdot i = -i$

$i^{31} = i^{28} \cdot i^{3}$ ($i^{28} = -1$)

Quiz 4.3-4.4 Fri.

MCT 4.1-4.4 Tues.

$a + bi$

$2 + 3i$

$\longrightarrow 0 + 7i$

$\longrightarrow 5 + 0i$

whiteboards

speed dating

GuidedPractice

Solve each equation.

3A. $4x^2 + 100 = 0$

$-100 \quad -100$

$\frac{4x^2}{4} = \frac{-100}{4}$

$\sqrt{x^2} = \sqrt{-25} \rightarrow \sqrt{25 \cdot -1}$

$x = \pm 5i$

3B. $x^2 + 4 = 0$

$-4 \quad -4$

$\sqrt{x^2} = \sqrt{-4}$

$x = \pm 2i$

GuidedPractice

5A. $(-2 + 5i) + (1 - 7i)$

$-1 - 2i$

5B. $(4 + 6i) - (-1 + 2i)$

$4 + 6i + 1 - 2i$

$5 + 4i$

EWE

13. $(6 - 8i)(9 + 2i)$

$6 + -8i$

$9 + 2i$

$54 - 72i$

$+12i \quad -16(i \cdot i)$

$70 - 60i$

$2+5i$

$2-5i$

$-10i \quad -25(i \cdot i)$

$4+10i$

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

Conjugate pair

$(3-7i)(3+7i)$

$3-7i$

$3+7i$

$21i \quad -49ii$

$-21i$

$9 \quad \#9$

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Conjugate partners

GuidedPractice

7A. $\frac{-2i}{3+5i}$ = no i

$\frac{2+i}{1+i}$ $\frac{2i+1i^2}{i}$

7B. $\frac{2+i}{1-i} \cdot \frac{1+i}{1+i} = \frac{1+3i}{2} = \frac{1}{2} + \frac{3i}{2}$

$\frac{-2i}{3+5i} \cdot \frac{(3-5i)}{(3-5i)} = \frac{-10-6i}{34} = \frac{-10}{34} - \frac{6i}{34}$ $\frac{1}{2} + \frac{3}{3}i$

$3+5i$
$3-5i$
$9-25i^2$

FFOO

$-2i(3-5i) = -6i+10i^2$

$= \frac{-5}{17} - \frac{3i}{17}$

$$\frac{5}{2-7i} \cdot \frac{2+7i}{2+7i} = \frac{10+35i}{53}$$

$$= \frac{10}{53} + \frac{35i}{53}$$

$$\begin{array}{r} 2-7i \\ 2+7i \\ \hline 4-49i^2 \end{array}$$

Speed dating

StudyTip

Reading Math Electrical engineers use *j* as the imaginary unit to avoid confusion with the *i* for current.

42. $9+12i = 3x+4yi$

$\frac{9}{3} = \frac{3x}{3}$ $\qquad$ $\frac{12i}{4i} = \frac{4yi}{4i}$

$x = 3$ $\qquad$ $y = 3$

Complex numbers are used with electricity. In these problems, j usually represents the imaginary unit. In a circuit with alternating current, the voltage, current, and impedance, or hindrance to current, can be represented by complex numbers. To multiply these numbers, use the FOIL method.

Real-World Example 6 Multiply Complex Numbers

ELECTRICITY In an AC circuit, the voltage V, current C, and impedance I are related by the formula $V = C \cdot I$. Find the voltage in a circuit with current $2 + 4j$ amps and impedance $9 - 3j$ ohms.

$V = C \cdot I$

$? = (2+4j)(9-3j)$

GuidedPractice

6. Find the voltage in a circuit with current $2 - 4j$ amps and impedance $3 - 2j$ ohms.