

LESSON 4-4 Complex Numbers

Part 2

I can... perform algebraic operations to complex numbers.

Find the solutions to:

$$\begin{aligned}
 0 &= x^2 + 36 = 0 \\
 &\quad -36 \quad -36 \\
 \sqrt{x^2} &= \sqrt{-36} \\
 x &= \pm \sqrt{-36} \\
 x &= \pm i\sqrt{36} \\
 x &= \pm 6i \quad \begin{matrix} x=6i \\ x=-6i \end{matrix}
 \end{aligned}$$

$$\sqrt{x^2} = \sqrt{100}$$

$$x = \pm 10$$

$$\sqrt{-32} = i\sqrt{32}$$

White Boards

$$0 = x^2 + 21$$

$$x = -i\sqrt{21}$$

$$x = i\sqrt{21}$$

$$2x^2 + 64 = 0$$

$$\frac{2x^2}{2} = \frac{-64}{2}$$

$$x^2 = -32$$

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

$$x = 4i\sqrt{2}$$

Adding/Subtracting Complex Numbers:

White Boards

$$1. (6 - 4i) + (5 + 9i)$$

$11 + 5i$

$$2. (6 - 4i) - (5 + 9i)$$

$1 - 13i$

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

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

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

Divide by 4, Find remainder

$$i^{40} = (i^4)^{10} = 1^{10} = 1$$

$$i^{11} = (i^4)^2 \cdot i^3 \quad \text{③} \quad i^3 = -i$$

$$i^{18} \quad i^2 = -1$$

$$i^{23} \quad i^3 = -i$$

White Boards!

You Try!

1. i^{12}

2. i^r

3. i^{41}

 i^{6823} **Multiplying Complex Numbers:**

1. FOIL/Dbl dist

2. Combine like terms (the i term).

3. Substitute -1 for i^2 since $i^2 = -1$.

4. Now combine like terms again (the non i terms this time).

$$(6 - 4i)(5 + 9i)$$

$$6(5 + 9i) - 4i(5 + 9i)$$

$$30 + 54i - 20i - 36i^2 = -1$$

$$30 + 34i - 36i^2$$

$$30 + 34i - 36(-1)$$

$$30 + 36 + 34i$$

$$66 + 34i$$

Multiplying Complex Numbers:

①

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

White Boards!!

$$26 - 2i$$

②

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

$$25$$

conjugate pair: a complex pair in the form of:

$$a + bi \quad \text{and} \quad a - bi$$

$$4 + 3i \quad 4 - 3i$$

ALL non-real solutions to a quadratic formula come like this!

Find the other solution to a quadratic equation if one solution is: (Conjugate Pair)

1. $3 - 9i$ $3 + 9i$

2. $-4 + 7i$

3. $8 + 2i$

4. $-2 - 8i$

Rationalizing Complex Denominators
Dividing Complex Numbers:

$$\frac{(2 - 4i)}{(3 + 5i)}$$

1. Determine the conjugate of the denominator.
 In this case it is $(3 - 5i)$

2. Use this to make a fraction.

$$\frac{(3 - 5i)}{(3 - 5i)}$$

3. Now multiply this fraction by your original.

$$\frac{(2 - 4i)(3 - 5i)}{(3 + 5i)(3 - 5i)}$$

4. Be sure to do both the top and bottom separately!

5. Simplify!

$$\frac{(2-4i)(3-5i)}{(3+5i)(3-5i)} = \frac{-14-22i}{34} = \frac{-7}{17} - \frac{11i}{17}$$

$$\begin{aligned} & (2-4i)(3-5i) \\ & 2(3-5i) - 4i(3-5i) \\ & 6 - 10i - 12i + 20i^2 \\ & \underline{-14 - 22i} \end{aligned}$$

$$\begin{aligned} & (3+5i)(3-5i) \\ & 3(3-5i) + 5i(3-5i) \\ & 9 - 15i + 15i - 25i^2 \\ & \underline{34} \end{aligned}$$

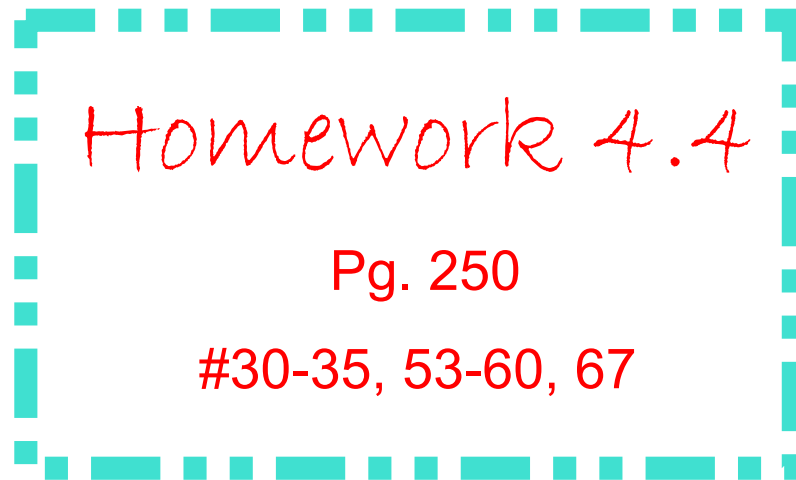
Simplify $\frac{(5+i) \cdot \frac{-2i}{-2i}}{2i}$

$$\frac{-2i}{-2i} = \frac{-10i - 2i^2}{-4i^2}$$

$$= \frac{2-10i}{4}$$

$$\frac{2}{4} - \frac{5i}{2}$$

$$\frac{1}{2} - \frac{5i}{2}$$



Different than your Stamp Sheet!