4-2 Review of Complex Numbers

Objective: Students will be able to:

Know the parts of a complex number

Know how to add, subtract, and multiply 2 complex numbers

Know what a conjugate is and how to find one

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

or

$$i^2 = -1$$

Definition

Complex numbers are numbers of the form $a+bi$, where a and b are real numbers. The real number a is called the real part and the number b is called the imaginary part.

Identify the real and imaginary parts of each complex number.

R I

$4+5i$

$5-i$

R I

$3+0i$

$7i$

Write each of the following as a pure imaginary number.

$\sqrt{-16}$

$4i$

$\sqrt{-3}$

$i\sqrt{3} = \sqrt{3}\,i$

$\sqrt{-18}$

$9 \cdot 2$

$3 \cdot 3$

$3i\sqrt{2}$

$-\sqrt{-81}$

$-9i$

You Try

$\sqrt{-12}$

$\sqrt{-5}$

$\sqrt{-36}$

Write each in Standard Form. State the real and imaginary parts.

$2-\sqrt{-25}$

$3+\sqrt{-50}$

$\dfrac{4-\sqrt{-12}}{2}$

You Try

$-2-\sqrt{-8}$

$\dfrac{6-\sqrt{-72}}{3}$

Add:

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

$2+2i$

$$\left(4+\sqrt{-25}\right)+\left(-6-\sqrt{-16}\right)$$

$5i$ $\qquad$ $4i$

$-2+i$

Subtract:

$$(-3+7i)-(5-4i)$$

$$\left(3+\sqrt{-12}\right)-\left(-2-\sqrt{-27}\right)$$

You Try

$$\left(4-\sqrt{-4}\right)+\left(-7+\sqrt{-9}\right)$$

$$(4-2i)-(-2+7i)$$

Multiply

$$4i(3-6i)$$

$-24(-1)$

$12i - 24i$

$+24$

$24 + 12i$

$i = \sqrt{-1}$

$i^2 = -1$

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

$-6 + 2i + 12i - 4i^2$

$+4$

$-2+14i$

Remember from before:

$$\sqrt[n]{a}\sqrt[n]{b} = \sqrt[n]{ab}$$

only works when $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers

This means that

$$\sqrt{a}\sqrt{b} \neq \sqrt{ab} \text{ if } a < 0 \text{ or } b < 0$$

Multiply

$$\sqrt{-25}\sqrt{-4}$$

$(5i)(2i)$

$10i^2$

-10

$$\left(2+\sqrt{-16}\right)\left(1-\sqrt{-4}\right)$$

You Try

$$\sqrt{-9}\sqrt{-36}$$

$$\left(2+\sqrt{-36}\right)\left(4-\sqrt{-25}\right)$$

Complex Conjugate

If $a+bi$ is a complex number, then its conjugate is defined as $a-bi$

Name the conjugate of the following complex numbers

$3+2i$ $\quad$ $4-3i$ $\quad$ $-16+32i$

3-2i $\quad$ 4+3i $\quad$ -16-32i

$-17i$ $\quad$ $4i$

17i $\quad$ -4i

Multiply (What Happens?)

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

$16-12i+12i-9i^2$

$+9$

25

$$\frac{(3+2i)(7+6i)}{(7-6i)(7+6i)}$$

$$\frac{21+18i+14i+12i^2}{49+42i-42i-36i^2}$$

$i^2 = -1$, so $12i^2 = -12$ and $-36i^2 = +36$

$$= \frac{9+32i}{85}$$

$$\frac{10}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{10\sqrt{5}}{5} = 2\sqrt{5}$$