

Section 7.4 Part 1: Complex Number Review

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6:30 PM

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

$$i^2 = -1$$

$$i^3 = i^2 \cdot i = -1i = -i$$

$$i^4 = i^2 \cdot i^2 = (-1)(-1) = 1$$

$$i^5 = i^4 i = 1i = i$$

(ex) simplify

$$\begin{aligned} \text{a)} \quad \sqrt{-4} &= \sqrt{-1 \cdot 4} = \sqrt{-1} \sqrt{4} \\ &= i \sqrt{4} \\ &= i^2 \\ &= 2i \end{aligned}$$

$$\text{b)} \quad \sqrt{-8}$$

$$i\sqrt{8}$$
$$2i\sqrt{2}$$

Complex numbers

$$a + bi$$

complex # in
standard form

a = real part

b = imaginary part

(ex)

$$3 + 4i$$

$$a = 3, b = 4$$

$$-1.2 - 5i$$

$$a = -1.2$$

$$b = -5$$

$$10$$

$$10 + 0i$$

$$a = 10, b = 0$$

(ex) Apply the given op.

$$a) \quad (3 + 4i) + (-6 + 7i)$$

$$-3 + 11i$$

$$b) (3 + 4i) - (-6 + 7i)$$

$$= 3 + 4i + 6 - 7i$$

$$= \boxed{9 - 3i}$$

$$c) \sqrt{-2} \cdot \sqrt{-10}$$

$$i\sqrt{2} \cdot i\sqrt{10}$$

$$i \cdot i \sqrt{2} \sqrt{10}$$

$$i^2 \sqrt{2 \cdot 10}$$

$$-1 \sqrt{20}$$

$$-2\sqrt{4 \cdot 5}$$

$$-2\sqrt{5}$$

Poke \odot out first

$$\begin{array}{l} \sqrt{-2} \sqrt{-10} \\ \sqrt{20} \\ 2\sqrt{5} \end{array}$$

$$d) 3i(-2 + 9i)$$

$$\begin{aligned}
 & -6i + 27i^2 \\
 & -6i + 27(-1) \\
 & -6i - 27 \\
 & \boxed{-27 - 6i}
 \end{aligned}$$

e)

$$\begin{aligned}
 & (-4 - 7i)(3 + 5i) \\
 & -12 - 20i - 21i - 35i^2 \quad (-1) \\
 & -12 - 41i + 35 \\
 & \boxed{23 - 41i}
 \end{aligned}$$

f)

$$\frac{5i}{3 + 2i}$$

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

$$\begin{aligned}
 & A + B \\
 & A - B
 \end{aligned}
 \left. \vphantom{\begin{matrix} A+B \\ A-B \end{matrix}} \right\} \text{conjugate}$$

$$\begin{aligned}
 & (A+B)(A-B) \\
 & A^2 - \cancel{AB} + \cancel{AB} - B^2 \\
 & = A^2 - B^2
 \end{aligned}$$

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

$$\rightarrow \frac{(A+B)(A-B)}{A^2-B^2}$$

$$= \frac{15i - 10i^2}{9 - 4i^2}$$

$$= \frac{15i + 10}{13}$$

$$= \frac{15}{13}i + \frac{10}{13}$$

$$= \frac{10}{13} + \frac{15}{13}i$$