

5.6 Complex Number

$$a + bi$$

Real

Imaginary

$$2 + 3i$$

2

3

$$7 - 5i$$

7

-5

$$\sqrt{-49}$$

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

$$7i$$

$$\sqrt{49 \cdot -1}$$

$$\sqrt{49} \sqrt{-1}$$

$$7i$$

$$(i)^2 = (\sqrt{-1})^2$$

$$i^2 = -1$$

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

$$i^2 = -1$$

$$\begin{aligned}
 i &= \sqrt{-1} \\
 i^2 &= -1 \\
 i^3 &= i \cdot i^2 \\
 i^3 &= \sqrt{-1}(-1) \\
 i^3 &= -\sqrt{-1} \\
 \rightarrow i^3 &= -i \\
 i^4 &= i^3 \cdot i \\
 i^4 &= -i \cdot i \\
 i^4 &= -i^2 \\
 i^4 &= -(-1) \\
 i^4 &= 1 \\
 i^5 &= i^4 \cdot i \\
 i^5 &= 1 \cdot \sqrt{-1} \\
 i^5 &= \sqrt{-1} \\
 i^5 &= i \\
 i^6 &= i^4 \cdot i^2 \\
 i^6 &= 1(-1) \\
 i^6 &= -1 \\
 i^6 &= i^2
 \end{aligned}$$

$$\begin{aligned}
 x^4 \cdot x^2 \\
 x^6
 \end{aligned}$$

$$\begin{array}{lll}
 i^1 = \sqrt{-1} & i^5 & i^9 & i^{13} \\
 i^2 = -1 & i^6 & i^{10} & i^{14} \\
 i^3 = -i = -\sqrt{-1} & i^7 & i^{11} & i^{15} \\
 i^4 = 1 & i^8 & i^{12} & i^{16}
 \end{array}$$

$$\begin{array}{l}
 i^{27} \\
 i^{67}
 \end{array}
 \begin{array}{l}
 4 \overline{) 127} \\
 \underline{48} \\
 87 \\
 \underline{16} \\
 27 \\
 \underline{28} \\
 3
 \end{array}
 \begin{array}{l}
 R3 \\
 i^3
 \end{array}$$

$$\begin{array}{l}
 i^{129} \\
 i
 \end{array}
 \begin{array}{l}
 4 \overline{) 129} \\
 \underline{124} \\
 5
 \end{array}
 \begin{array}{l}
 R1 \\
 i
 \end{array}$$

$$\begin{array}{l}
 i^{20} \\
 i
 \end{array}
 \begin{array}{l}
 4 \overline{) 20} \\
 \underline{16} \\
 4
 \end{array}
 \begin{array}{l}
 R0 \\
 i
 \end{array}$$

$$(2+5i) + (3-7i)$$

$$5 + -2i$$

$$5 - 2i$$

$$(8-3i) - (2+4i)$$

$$6 - 7i$$

$$8 - 3i - 2 - 4i$$

$$6 - 7i$$

$$(1-3i) - (-2-7i)$$

$$3 + 4i$$

$$-3i + 7i$$

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

FOIL

$i^2 = -1$

$6 + 8i + 15i + 20i^2$

$6 + 8i + 15i + 20(-1)$

$6 + 23i - 20$

$-14 + 23i$

$a + bi$

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

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

$6 - 10i - 4(-1)$

$6 - 10i + 4$

$10 - 10i$

$(5+3i)(5-3i)$ Conjugates

$25 - 15i + 15i - 9i^2$

$25 - 9(-1)$

$25 + 9$

34

$34 + 0i$

Conjugate

Switch
middle
sign

$2+9i$

$2-9i$

$1+6i$

$1-6i$

$3-5i$

$3+5i$

$2(5+3i)$

$10 + 6i$

$2 + 3i$
 Real Imaginary

$(2, 3)$

X

-14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14

$2 - 3i$
 Real Imaginary
 $(2, -3)$

Imaginary.
 y-axis
 $0 + di$



$5 + 0i$
 $5 - 0i$

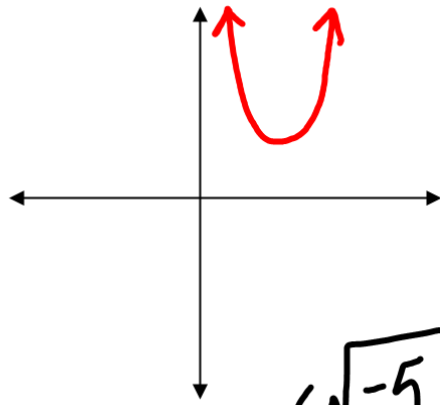
Real

x-axis

$-1 + 4i$

Y

Y



$$\begin{array}{l}
 \sqrt{-5} \cdot \sqrt{-7} \\
 \sqrt{5 \cdot -1} \cdot \sqrt{7 \cdot -1} \\
 i\sqrt{5} \cdot i\sqrt{7} \\
 i^2 \sqrt{35} \\
 i^2 = -1 \\
 \rightarrow -\sqrt{35}
 \end{array}$$

$$\begin{array}{l}
 \sqrt{-4} \quad \sqrt{-9} \\
 2i \quad \cdot \quad 3i \\
 6i^2 \\
 -6
 \end{array}$$

$$\left(\frac{1}{2} + \frac{3}{4}i\right) + \left(\frac{1}{3} - \frac{1}{5}i\right)$$

$$\left(\frac{3}{6} + \frac{15}{20}i\right) + \left(\frac{2}{6} - \frac{4}{20}i\right)$$

$$\frac{5}{6} + \frac{11}{20}i$$

$$(3 + 7i)^2$$

$$(x+3)^2$$

$$x^2 + 6x + 9$$

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

Foll

$$9 + 21i + 21i + 49i^2$$

$$9 + 42i - 49$$

$$-40 + 42i$$

p 320

$$14-22 E$$

$$46-62 E$$

$$76-86 E \quad \text{Graph}$$

$$\begin{aligned} 15 \quad & \sqrt{-36} \\ & \sqrt{36 \cdot -1} \\ & \sqrt{36} \sqrt{-1} \\ & 6i \end{aligned}$$

$$16. \quad 6 + 0i$$

Real 6 Imaginary 0