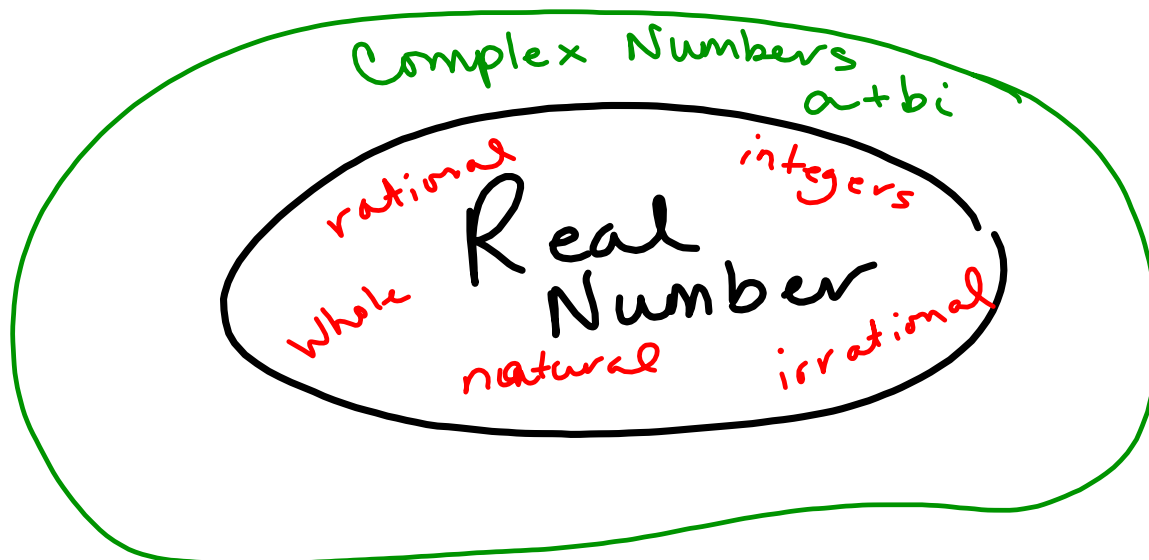


Chapter 2B.1 (2.4)
Complex Numbers

TODAY: you will perform operations with complex numbers and plot complex numbers in the complex plane



COMPLEX NUMBERSComplex Number
in
Standard form

$$a + bi$$

real
partimaginary
part

$$i^2 = -1$$

DEFINITION
OF
imaginary
unitAdding :

$$(a + bi) + (c + di) = (a + c) + (bi + di)$$

EXAMPLE :

$$(2 + 3i) + (4 - 2i) = 6 + i$$

→ similar
to combining
like terms

(Ex1) Add or Subtract

a) $(6-3i) + (1+2i)$

$$\boxed{7-i}$$

b) $(5-i) - (2-4i)$

$$\boxed{3+3i}$$

$$3-3i$$

$$3-5i$$

$$\boxed{3+3i}$$

$$7-4$$

$$7-4i$$

(Ex2) Multiply

a) $2(17-5i)$

$$\boxed{34-10i}$$

c) $(1+7i)^2 = (1+7i)(1+7i)$

$$\begin{array}{r}
 1 \quad 7i \\
 \hline
 1 \quad 7i \\
 7i \quad 49i^2 \\
 \hline
 1 \quad 7i \quad 49i^2 \\
 \quad \quad \quad 49(-1) \\
 \quad \quad \quad -49 \\
 \hline
 \end{array}$$

$$\boxed{-48+14i}$$

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

$$\begin{array}{r}
 3 \quad -i \\
 \hline
 5 \quad 15 \quad -5i \\
 4i \quad 12i \quad -4i^2 \\
 \hline
 15 \quad -5i \quad 12i \quad -4i^2 \\
 \quad \quad \quad \quad \quad \quad -4(-1) \\
 \quad \quad \quad \quad \quad \quad 4 \\
 \hline
 \end{array}$$

$$\boxed{19+7i}$$

d) $(4+5i)(4-5i)$

$$\begin{array}{r}
 4 \quad 5i \\
 \hline
 4 \quad 16 \quad 20i \\
 -5i \quad -20i \quad -25i^2 \\
 \hline
 16 \quad 20i \quad -20i \quad -25i^2 \\
 \quad \quad \quad \quad \quad \quad -25(-1) \\
 \quad \quad \quad \quad \quad \quad 25 \\
 \hline
 \end{array}$$

$$\boxed{41}$$

WARM-UPSimplify i^7

$$i^1 = i$$

$$i^2 = -1$$

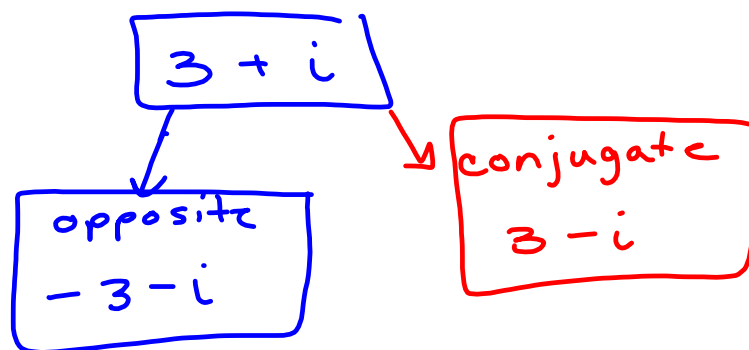
$$i^3 = (i^2)i = -1i = -i$$

$$i^4 = (i^3)i = (-i)(i) = -i^2 = -(-1) = 1$$

$$i^5 = (i^4)i = 1i = i$$

$$i^6 = (i^5)i = i(i) = i^2 = -1$$

$$i^7 = (i^6)i = -1(i) = -i$$

COMPLEX CONJUGATES

What happens when multiplying a complex number by its conjugate?

The product is always a real number

$$(a + bi)(a - bi)$$

product of
complex
conjugates

	a	bi
a	a^2	abi
-bi	$-abi$	$-b^2i^2$ $-b^2(-1)$ b^2

$$a^2 + b^2$$

Short cut

EX1) Multiply

a.) $(2 + 3i)(2 - 3i)$

$$a=2 \quad b=3$$

$$a^2 + b^2$$

$$4 + 9 = 13$$

b.) $(1 - i)(1 + i)$

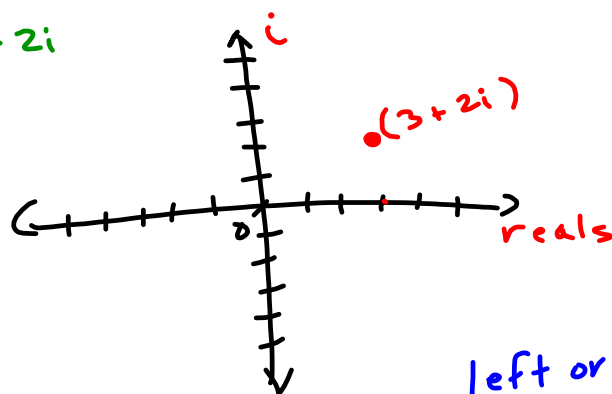
$$a=1 \quad b=1$$

$$a^2 + b^2 = 1^2 + 1^2 = 2$$

Verify
the
short
cut

	2	3i
2	4	$6i$
-3i	$-6i$	$-9i^2$ $-9(-1)$ 9

13

Graphing Complex NumbersGraph $3+2i$ 

left or right \rightarrow real
up or down \rightarrow imaginary

Kahoot.it

<https://play.kahoot.it/#/k/ec0ce9ee-9bb4-48e7-80ae-c9b63f10dd1b>

