0-2 Guided Notes

Operations with Complex Numbers

Objectives:

1. Perform operations with pure imaginary numbers and complex numbers.
2. Use complex conjugates to write quotients of complex numbers in standard form.

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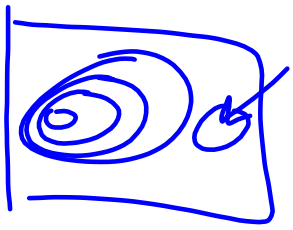
The imaginary unit i is defined as the principal square root of -1 and can be written as:



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

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KEY CONCEPTS

$i^1 = i$ $\quad i^5 = i$

$i^2 = -1$ $\quad i^6 = -1$

$i^3 = -i$ $\quad i^7 = -i$

$i^4 = 1$ $\quad i^8 = 1$

$i^9 = i^4 \cdot i^4 \cdot i$

$i^4 \cdot i$

$i^4 \cdot i^2$

$i^4 \cdot i^4$

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Powers of i

$4\overline{)43}$ R 3 (quotient 10, -40)

a. $i^{43} = i^3 = -i$

$i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^3$

$4\overline{)1001}$ R 1 (quotient 250, -1000)

b. $i^{1001} = i^1 = i$

c. $i^{200} = 1$

$4\overline{)18}$ R 2 (quotient 4, -16)

d. $i^{-18} = i^2 = -1$

$10i$

$10\sqrt{-1}$

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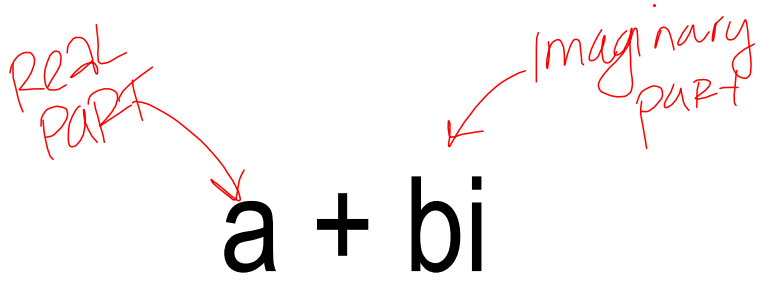
COMPLEX NUMBERS



ex 2 + 3i

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ADDING, SUBTRACTING, MULTIPLYING COMPLEX NUMBERS

a.) (5 – i) + (-2 + 4i)

5 – i – 2 + 4i

3 + 3i

b.) (10 – 2i) – (3 + 2i)

7 – 4i

c.) (2 – 2i)(4 – 3i)

8 – 6i – 8i + 6i² (i² = -1)

8 – 6i – 8i – 6

2 – 14i

$(2-2\sqrt{-1})(4-3\sqrt{-1})$

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RATIONALIZE A COMPLEX EXPRESSION

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

$$\frac{5-2i}{3-2i}\cdot\frac{3+2i}{3+2i} = \frac{15+10i-6i+4i^2}{9+6i-6i+4i^2}$$

$$= \frac{19+4i}{13}$$

$$= \frac{19}{13} + \frac{4}{13}i$$

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$$29\cdot\frac{(3-2i)(-4+i)}{(-4-i)(-4+i)}$$

$$= \frac{-12+8i+3i+2i^2}{16+1i^2}$$

$$= \frac{-10+11i}{17} = \frac{-10}{17} + \frac{11}{17}i$$

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Homework

P8 #1-29 odd

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