

Chapter 20 Recap

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

$$i^2 = -1$$

$$\begin{aligned} \sqrt{-20} &= \\ &= \sqrt{20} \sqrt{-1} \\ &= \sqrt{4} \sqrt{5} i \\ &= 2i\sqrt{5} \end{aligned}$$

RULE: Divide the exponent by 4

$$.25 = i$$

$$.5 = -1$$

$$.75 = -i$$

$$\text{no dec} = 1$$

$$i^3 = -i$$

Multiplying: outs with outs, ins with ins

$$(-3\sqrt{-10})(2\sqrt{-10})$$

$$\begin{aligned} &(-6)10i^2 \\ &+60i^2 \end{aligned}$$

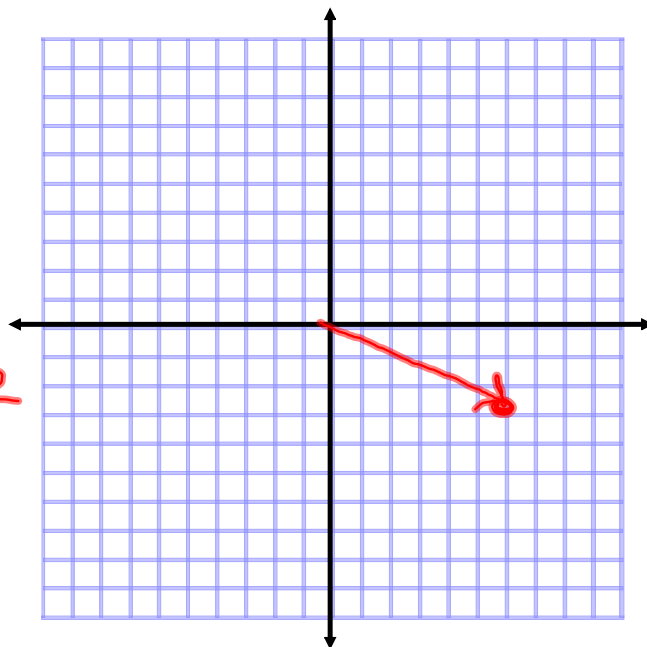
Dividing: outs with outs, ins with ins

$$\frac{\sqrt{-98}}{\sqrt{-2}} \quad \frac{7\sqrt{2}}{1\sqrt{2}}$$

Graphing: $a + bi$

Magnitude: length

$$\begin{aligned} & a + bi \\ & 6 - 3i \\ & \sqrt{a^2 + b^2} \\ & \sqrt{6^2 + 3^2} \\ & \sqrt{45} \\ & 3\sqrt{5} \end{aligned}$$



Operations with Complex Numbers:

Addition: $(5 + 3i\sqrt{3}) + (6 - 2i\sqrt{3}) = 11 + i\sqrt{3}$

Subtraction: $(5 + 2i\sqrt{3}) - (6 - 2i\sqrt{3}) = -1 + 4i\sqrt{3}$

Multiplication: $(3 + i)(5 - 2i)$
 $15 - 6i + 5i - 2i^2$
 $15 - i + 2$
 $17 - i$

Division: $\frac{(1-3i)(2+7i)}{(2-7i)(2+7i)}$
 $\frac{2+7i-6i-21i^2}{4+49}$
 $\frac{23+i}{53}$

Conjugate: $a+bi \rightarrow$

$$-6+i \rightarrow -6-i$$

$$3-6i \rightarrow 3+6i$$

$$5i \rightarrow -5i$$

Multiplicative Inverse:

ex) $8 - 4i$ $\frac{1}{(8-4i)(8+4i)} (8+4i)$

$$\frac{8+4i}{64+16} = \frac{8+4i}{80} = \frac{4(2+i)}{80}$$

Quadratic Formula with Imaginary Roots:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant: Nature of Roots

- perfect square *real, rat, uneq*
x-axis two times
- non perfect square *real, irrat, uneq.*
- = 0 *equal / tangent to x-axis*
- negative *imag. / float*

$$b^2 - 4ac$$

Working Backwards to write a quadratic equation:

{3i, -3i}

$$(x-3i)(x+3i)$$

$$x^2 - \cancel{3ix} - \cancel{3ix} - 9i^2$$

$$x^2 + 9 = 0$$

Sum of roots = $-b/a$

Product of roots = c/a

{2+i, 2-i}

$$\text{Sum} = 4 \quad \begin{matrix} b = -4 \\ a = 1 \end{matrix}$$

$$\text{Prod.} = 5 \quad c = 5$$

$$x^2 - 4x + 5 = 0$$

Quadratic Inequalities:

$$\underline{\quad} > 0$$

Shade?



Solution set?

$$\{x \mid \text{or} \}$$

$$\underline{\quad} < 0$$



$$\{x \mid < x < \}$$

Homework:

pg 973 #2,3,5-10,15,19,26,28,31-36,40,42-44

pg 961 #42,43

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by mon!