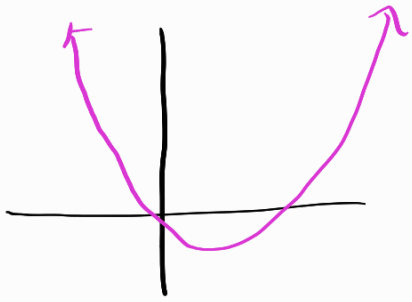
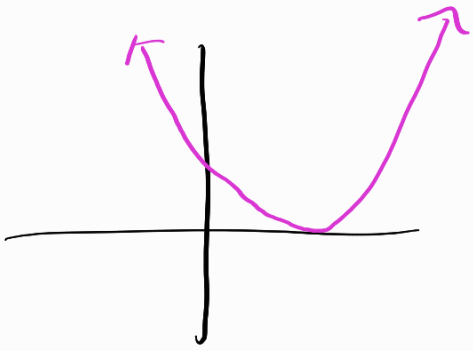
11/21/2023

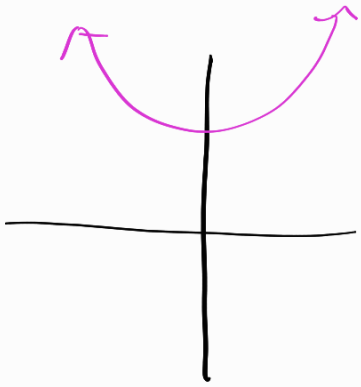
So far....



2 x-int



1 x-int



no x-int

$b^2-4ac>0$

factorable

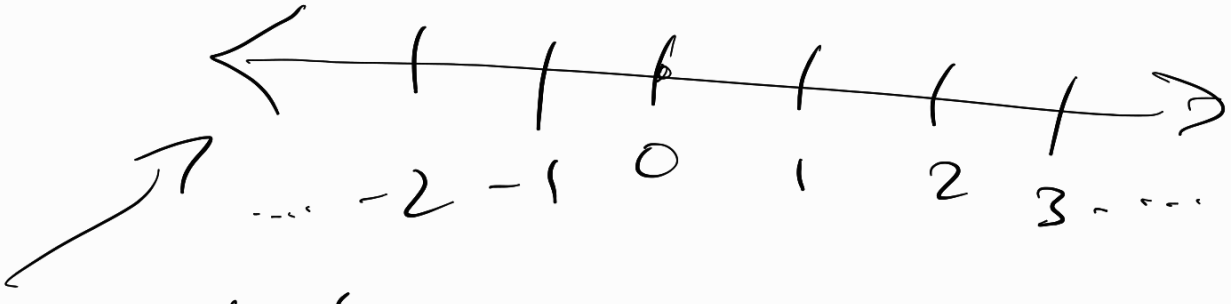
$b^2-4ac=0$

factorable

$b^2-4ac<0$

not factorable

Real quadratics

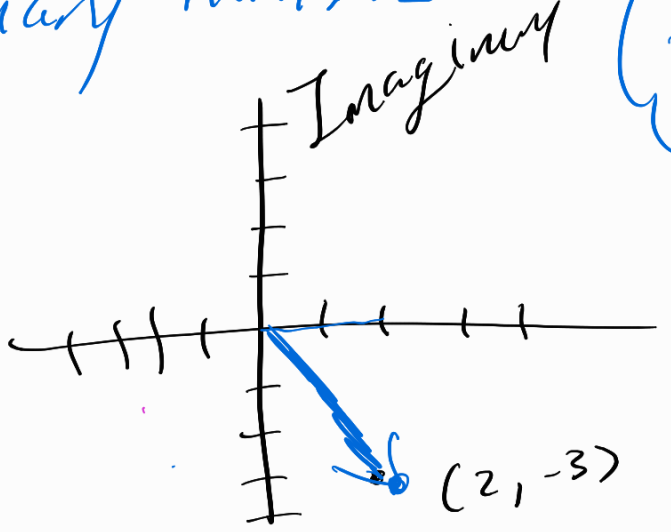


one dim'l

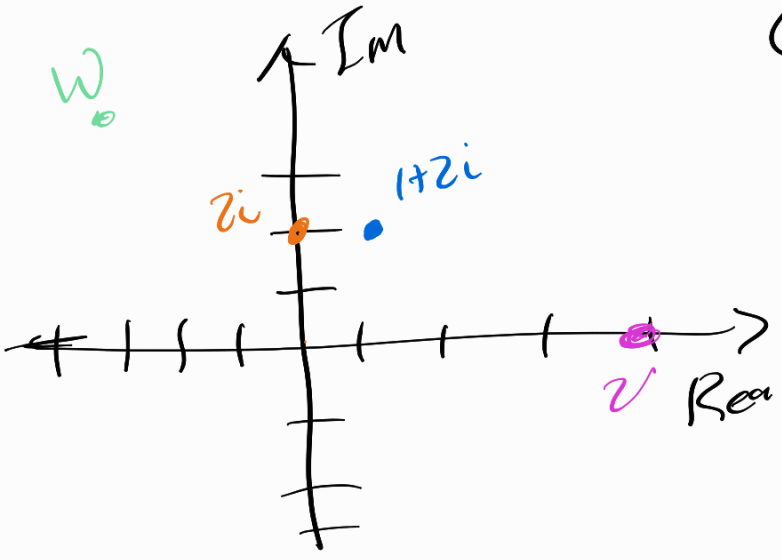
Complex Numbers

"imaginary numbers"

Imaginary number



$2 - 3i$



W

C

- $z = 1 + 2i$
- $w = -3 + 4i$

$u = 2i$

$v = 4$

A complex number is a number of the form $a + bi$

real constants

$i^2 = -1$ ← "imaginary unit"

Complex Algebra

complex conjugate

$z = 1 + 3i$

$w = 2 - 5i$

$\overline{z} = \overline{1+3i} = 1-3i$

$\overline{w} = \overline{2-5i} = 2+5i$

$z + w = 1 + 3i + 2 - 5i$

$= \boxed{3 - 2i}$

$z - w = 1 + 3i - \overline{(2 - 5i)}$

$= 1 + 3i - 2 + 5i$

$= \boxed{-1 + 8i}$

$z \cdot w = (1 + 3i)(2 - 5i)$

FOIL $= 2 - 5i + 6i - 15i^2$ (-1)

$$= 2 + 1i - 15(-1)$$

$$= 2 + 1i + 15$$

$$= 17 + i$$

$z = 1 + 3i$

$\bar{z} = 1 - 3i$

$$z \cdot \bar{z} = (1+3i)(1-3i) = 1^2 - (3i)^2$$

$(a+b)(a-b) = a^2 - b^2$

$$= 1 - 9i^2$$

$$= 1 + 9$$

$W = 5 - 2i$

$z = 1 + 3i$

$$\frac{w}{z} = \frac{5-2i}{(1+3i)}\left(\frac{1-3i}{1-3i}\right) = \frac{(5-2i)(1-3i)}{1^2+3^2}$$

$$= \frac{(5-2i)(1-3i)}{10} = \frac{5-15i-2i+6\overset{-1}{i^2}}{10}$$

$$= \frac{5-6-17i}{10}$$

$$= \frac{-1-17i}{10}$$

$$= \boxed{\frac{-1}{10} - \frac{17}{10}i}$$

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

$$\sqrt{ab} = \sqrt{a}\sqrt{b}$$

$$\sqrt{400} = \sqrt{4}\sqrt{100} = 2 \cdot 10 = 20$$

$$\sqrt{24} = \sqrt{4}\sqrt{6} = 2\sqrt{6}$$

$$\stackrel{!}{=} 2\sqrt{2}\sqrt{3}$$

$$\sqrt{-400} = \sqrt{-1} \cdot \sqrt{400}$$

$$\stackrel{!}{=} 20\sqrt{-1}$$

$$\stackrel{!}{=} 20i$$

$$\sqrt{-100} = \sqrt{100}\, i$$

$$\stackrel{!}{=} 10i$$

$$\sqrt{-23} = \sqrt{23}\, i$$

$$f(x) = x^2 - 4x + 13 = 0$$

- $b^2 - 4ac$

no x-int

$16 - 4(1)(13)$

$16 - 52 = -36$

$$x = \frac{4 \pm \sqrt{-36}}{2} = \frac{4 \pm 6i}{2}$$

$$\frac{4}{2} + \frac{6i}{2}, \quad \frac{4}{2} - \frac{6i}{2}$$

$$2 + 3i, \quad 2 - 3i$$

Find all complex x-int for

$$f(x) = x^2 + x + 100$$

$\chi =$