multiplicative inverse means reciprocal

m.i. of $a+bi$ is $\frac{1}{a+bi} \cdot \frac{a-bi}{a-bi}$

#20 $\frac{1}{2+5i} \cdot \frac{2-5i}{2-5i}$

$= \frac{2-5i}{4+25} = \frac{2-5i}{29}$

$= \frac{2}{29} - \frac{5}{29}i$

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

$4 - 10i + 10i - 25i^2$

#22

$\frac{1}{a+bi} \cdot \frac{a-bi}{a-bi}$

$= \frac{a-bi}{a^2+b^2} = \frac{a}{a^2+b^2} - \frac{b}{a^2+b^2}i$

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

$a^2 - abi + abi - b^2i^2$

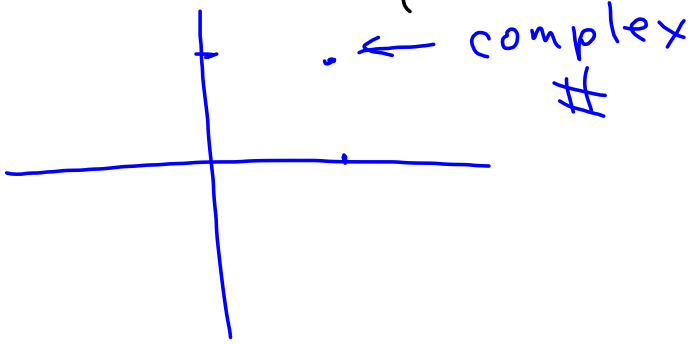
$a^2 + b^2$

If 2 complex numbers are equal,

① their real parts are equal,

and

② their imaginary parts are equal



Ex: $2x + 5yi = 10 + 25i$

Real parts same:

$2x = 10 \quad x = 5$

Imag parts same:

$5y = 25 \quad y = 5$

#21 $\frac{1}{8-12i} \cdot \frac{8+12i}{8+12i}$

$\frac{8+12i}{64+144} = \frac{8+12i}{208}$

$= \frac{4(2+3i)}{4(52)}$

$= \frac{2}{52} + \frac{3}{52}i$

$= \frac{1}{26} + \frac{3}{52}i$

Ex. $x^2 = -36$

$x = \pm\sqrt{-36}$

$= \pm i\sqrt{36}$

$= \pm i \cdot 6$

$= \pm 6i$

#7 $3x^2 + 2 = -62$

$-2 \quad -2$

$\frac{3x^2}{3} = \frac{-64}{3}$

$x^2 = -\frac{64}{3}$

#10 $-3x^2 + x - 3 = 0$

$a = -3 \quad b = 1 \quad c = -3$

$x = \frac{-1 \pm \sqrt{1 - 36}}{-6}$

$= \frac{-1 \pm i\sqrt{35}}{-6}$

$= \frac{-1}{-6} \pm \frac{\sqrt{35}}{-6} i$

$x = \frac{1}{6} \pm \frac{\sqrt{35}}{6} i$

solve quadratic equation w/ quadratic formula

solution

$$x = \frac{5 \pm \sqrt{-24}}{4}$$

put in "i"

$$= \frac{5 \pm i\sqrt{24}}{4}$$

simplify $\sqrt{\ }$

$$= \frac{5 \pm 2i\sqrt{6}}{4}$$

standard form

$$= \frac{5}{4} \pm \frac{2\sqrt{6}}{4} i$$

simplify

$$= \frac{5}{4} \pm \frac{\sqrt{6}}{2} i$$

$$\frac{2\sqrt{6}}{4}$$

$$= \frac{2\sqrt{6}}{2 \cdot 2}$$

#18 $x^2 - 6x + c = 0$

$a = 1 \quad b = -6$

(a) 2 real solutions

$b^2 - 4ac > 0$

$36 - 4c > 0$

$36 > 4c$

$4c < 36$

$c < 9$

#26 $x^2 - 2x + 3 = 0$

$x = \frac{2 \pm \sqrt{4 - 12}}{2}$

$= \frac{2 \pm 2i\sqrt{2}}{2}$

$= \frac{2(1 \pm i\sqrt{2})}{2}$

$= 1 \pm i\sqrt{2}$

Sum: $(1 + i\sqrt{2}) + (1 - i\sqrt{2})$

$= 1 + i\sqrt{2} + 1 - i\sqrt{2} = 2$

Product: $(1 + i\sqrt{2})(1 - i\sqrt{2})$

$1 - i\sqrt{2} + i\sqrt{2} - 2i^2$

$1 + 2 = 3$

$-i\sqrt{2} \cdot i\sqrt{2}$

$-i^2 \cdot \sqrt{2} \cdot \sqrt{2}$

$-i^2 \cdot 2$

2

"Find sum and product of roots"

① Quadratic Formula

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

suppose:

$x = 2 \pm 5i$

② sum:

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

$= 4$

③ product

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

$4 + 25 = 29$

$2 \cdot 2 - 2\cancel{5i} + 2\cancel{5i} - 25 \cdot i^2$

$4 - 25(-1)$

$4 + 25$

#27 $a = 5 \quad b = 2 \quad c = 1$

$$x = \frac{-2 \pm \sqrt{4 - 20}}{10} \quad 4i$$