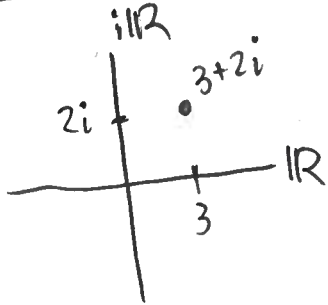


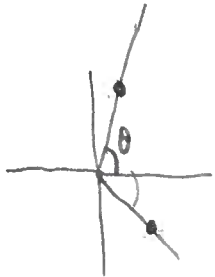
Complex numbers

$$i = \sqrt{-1} \rightarrow i^2 = -1$$

(1)



$$-i(1+5i) + (-i)(1+5i)$$



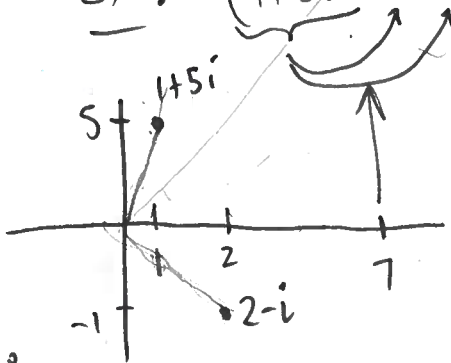
Ex: $(1+5i)(2-i) = 2(1+5i) - i(1+5i)$

$$= 2 + 10i - i - 5i^2$$

$$= (2+5) + (10-1)i$$

$$= 7 + 9i$$

$-5(-1) = +5$



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

$$(4i)^2 = 16i^2 = -16$$

$$\overline{1+4i} = 1-4i$$

$$\overline{1-4i} = 1-(-4i) = 1+4i$$

Ex: $\frac{3+2i}{1+4i} = \left(\frac{3+2i}{1+4i}\right)(1) = \left(\frac{3+2i}{1+4i}\right)\left(\frac{1-4i}{1-4i}\right)$

$$= \frac{(3+2i)(1) - (3+2i)(4i)}{(1+4i)(1) + (1+4i)(-4i)}$$

write as $a+bi$

$$\frac{a+b}{c} = \frac{a}{b} + \frac{b}{c}$$

$$\frac{4+2x}{2} \quad \cancel{2+2x}$$

$$\frac{4}{2} + \frac{2x}{2}$$

$$= \frac{3+2i - (12i + 8i^2)}{1+4i + (-4i^2 - 16i^2)}$$

$8i^2 = 8(-1) = -8$
 $16i^2 = -16$

$$= \frac{3+2i-12i+8}{1+4i+4i+16}$$

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

$\sqrt{8}i$
Square roots

$i = \sqrt{-1}$

~~$\sqrt{-8} = \sqrt{8}i$~~

if P, then Q. (2)

i not under \sqrt symbol!! $1+1=2$

$\sqrt{8i} = \sqrt{8}i$

$\sqrt{-24} = (\sqrt{24})i$

$\frac{1}{\sqrt{8}} = \frac{\sqrt{8}}{8}$

$\frac{1}{\sqrt{8}} = \frac{\sqrt{8}}{8}$

$\sqrt{8} \approx 2. \square$

$\frac{1}{2. \square} = \frac{2. \square}{8}$

harder to do by hand

$\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{4} \sqrt{2} = 2\sqrt{2}$

~~$1 = \sqrt{1} = \sqrt{(-1)(-1)}$~~
 $\stackrel{(*)}{=} \sqrt{-1} \sqrt{-1} = i \cdot i = i^2 = -1$
ERROR Why?

(*) Fails if we allow negatives

(*) $\sqrt{ab} = \sqrt{a} \sqrt{b}; a, b > 0$

~~NOT $\sqrt{4(-100)}$
 \parallel
 $\sqrt{400} = 20$~~

EX: Simplify

$\sqrt{-4} \sqrt{-100}$
 $= (i\sqrt{4})(i\sqrt{100})$
 $= (\sqrt{4})(\sqrt{100})i^2$
 $= 2(10)(-1)$
 $= -20$