IMAGINARY NUMBERS

square root of a negative number.

$i = \sqrt{-1}$

$i^1 = i$

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

$i^3 = i^2 \cdot i^1 = -1 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

$i^5 = i^4 \cdot i^1 = 1 \cdot i = i$

$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = -1$

0.25 $i^1 = i$

.5 $i^2 = -1$

0.75 $i^3 = -i$

0.00 $i^4 = 1$

I won! I won! (With 2 negatives in middle)

$i^{17} = i$

$17 \div 4 = 4$, $17 - 16 = 1$

i^{326} $\frac{326}{4} = 81.5$

$= i^2 = -1$

0.75 .00 0.25

$2i^{351} - 4i^{10000} + 7i^{625}$

$2(i^3) - 4(i^4) + 7(i)$

$2(-i) - 4(1) + 7i$

$= -2i - 4 + 7i$

$= \boxed{5i - 4}$

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$\sqrt{-6} \cdot \sqrt{-32}$ ← must take i out first.

$16 \cdot 2$

$i\sqrt{6} \cdot 4i\sqrt{2}$

$4i^2\sqrt{12}$

$4 \cdot 3$

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

$= -8\sqrt{3}$

Solve $3x^2 + 65 = 11$

$-65 \quad -65$

$\frac{3x^2}{3} = \frac{-54}{3}$

$\sqrt{x^2} = \sqrt{-18}$

$9 \cdot 2$

$x = \pm 3i\sqrt{2}$

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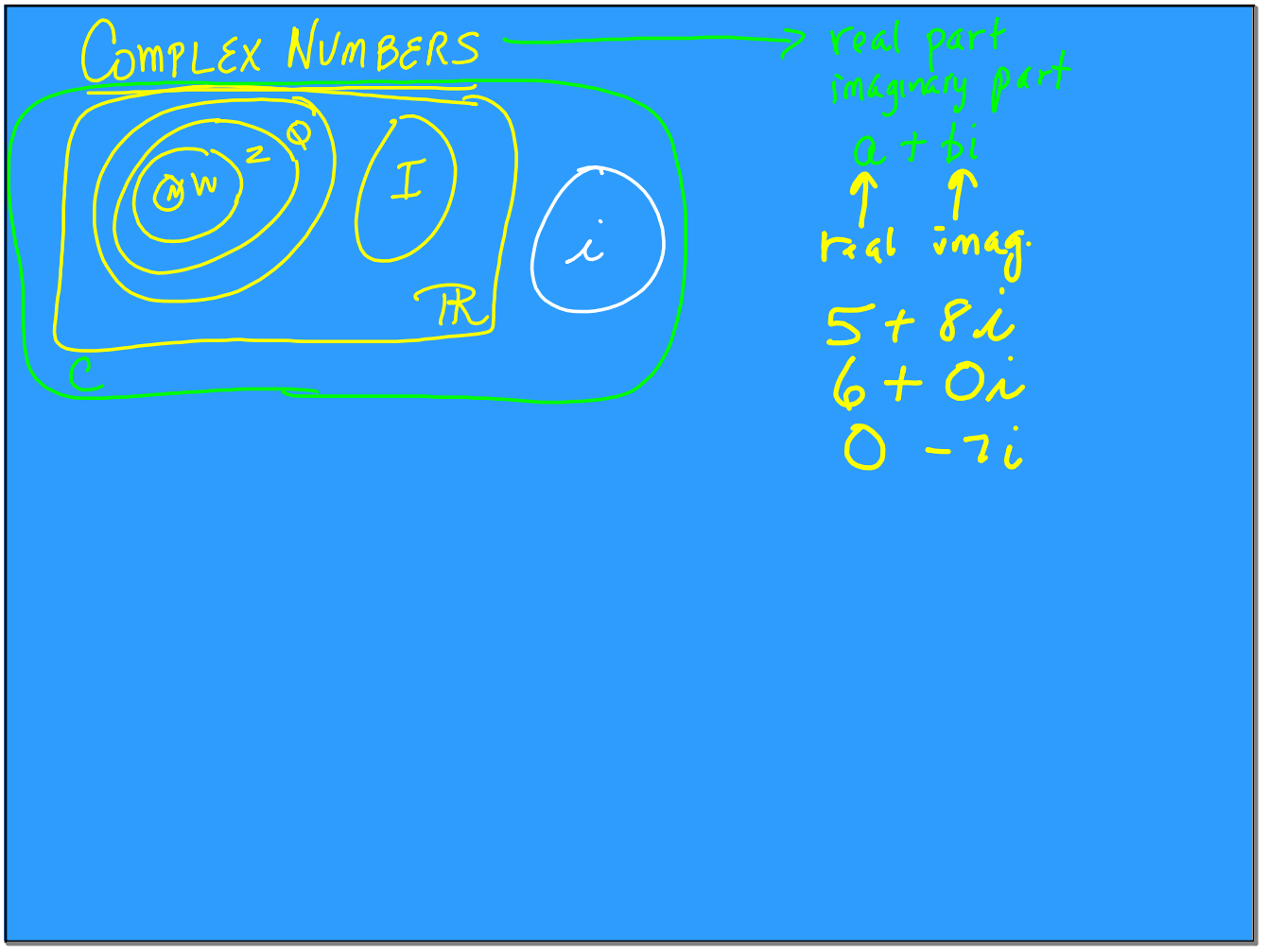


Add/Subtract

$(5+3i)+(7-8i)=12-5i$

$(9-6i)+(3+4i)=12-10i$

Multiplication – FOIL!

$(6-8i)(5+2i)$

$= 30+12i-40i+16i^2$

$(i^2=-1)$

$= \boxed{46-28i}$

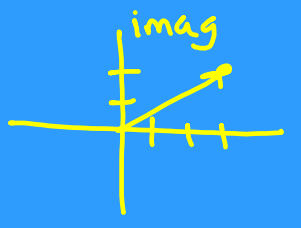
$(2-7i)^2=$

$$\frac{3+2i}{5i}\cdot\frac{i}{i} = \frac{3i+2i^2}{-5i^2} = \frac{-3i+2}{+5}$$

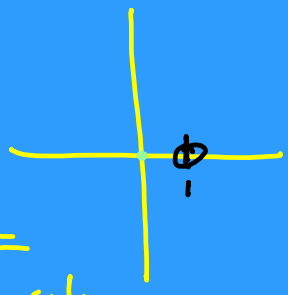
$$\frac{4+2i}{3+5i}\cdot\frac{(3-5i)}{(3-5i)} = \frac{12-20i+6i+10i^2}{9+25i^2} = \frac{22-14i}{34} = \frac{11-7i}{17}$$

FRACTALS - 1980

Benoit Mandelbrot



$3+2i$
$x \quad y$



Iteration =
Calculate value & then sub result back in func.

red = goes to ∞
orange = 5-10
yellow = 11-15

Fractals — Self-Similar

$f(x) = x^2 + C$
$f(x) = x^2 + (0+0i)$
$f(0) = 0^2 + 0 = 0$
$f(0) = 0^2 + 0 = 0$

$f(x) = x^2 + (1+0i)$
$f(0) = 0^2 + 1 = 1$
$f(1) = 1^2 + 1 = 2$
$f(2) = 2^2 + 1 = 5$
$f(5) = 5^2 + 1 = 26$
Goes to ∞