FRACTALS

Mon May 5 | Tues 13
Wed May 7 | Thurs 15
Fri May | Mon. 19

Discovered 1979/80 – Benoit Mandelbrot

Dynamical Systems – anything that moves or changes in time

* Weather prediction
* Stock market
* Chemical reactions

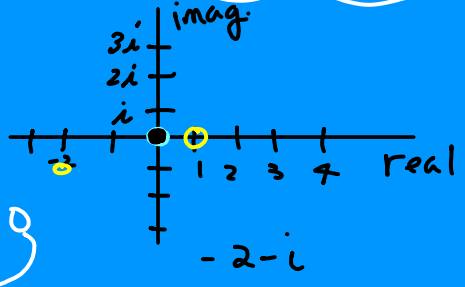
$f(x) = x^2 + c$

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

seed value $x = 0$

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

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



$f(x) = x^2 + (1+0i)$

$f(0) = 0^2 + 1 + 0i = 1$

$f(1) = 1^2 + (1+0i) = 2$

$f(2) = 2^2 + 1 + 0i = 5$

$f(5) = 5^2 + 1 + 0i = 26$

$f(26) = 26^2 + 1 = \text{big}$

= bigger

go to ∞.

Fractals = self-similar

orbit = the list of numbers that result from each iteration

1, 2, 5, 26. . . infinity

2-cycle or Period of 2

3, -5, 17, 0, 24

No pattern = chaotic

1 number = fixed pt.

Black = does not go to ∞

Red = goes to ∞ fast

orange

⋮

purple = goes to ∞ infinitely slowly

May 5, 2025

Mandelbrot Set--Choose coordinate for c-value. Always iterate beginning with 0. Change coordinate for c-value each time you want to color a different point.

Calculator:

1) $x^2 + (1+i) \mid x = 0$

2) $x^2 + (1+i) \mid x = Ans$

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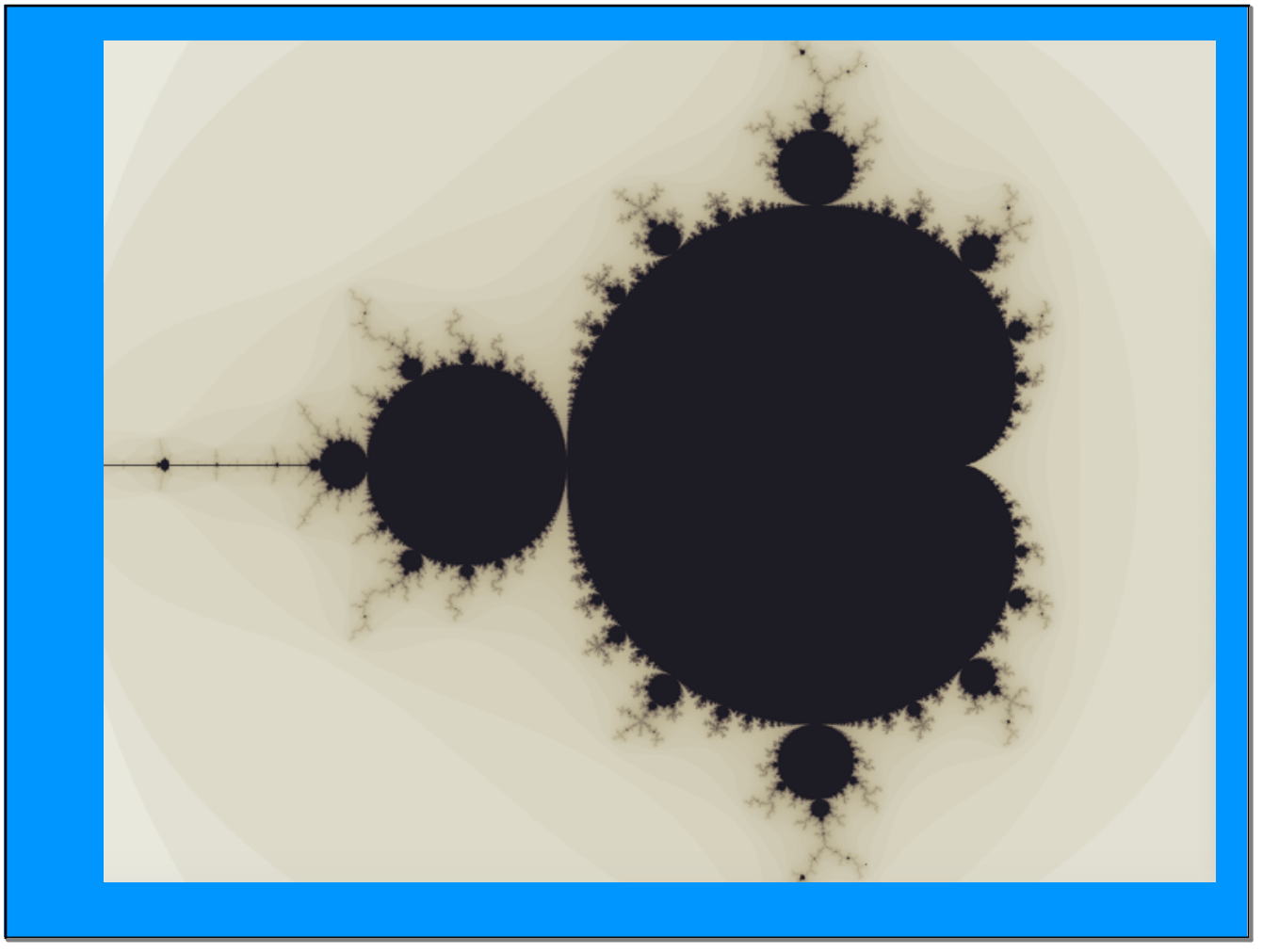

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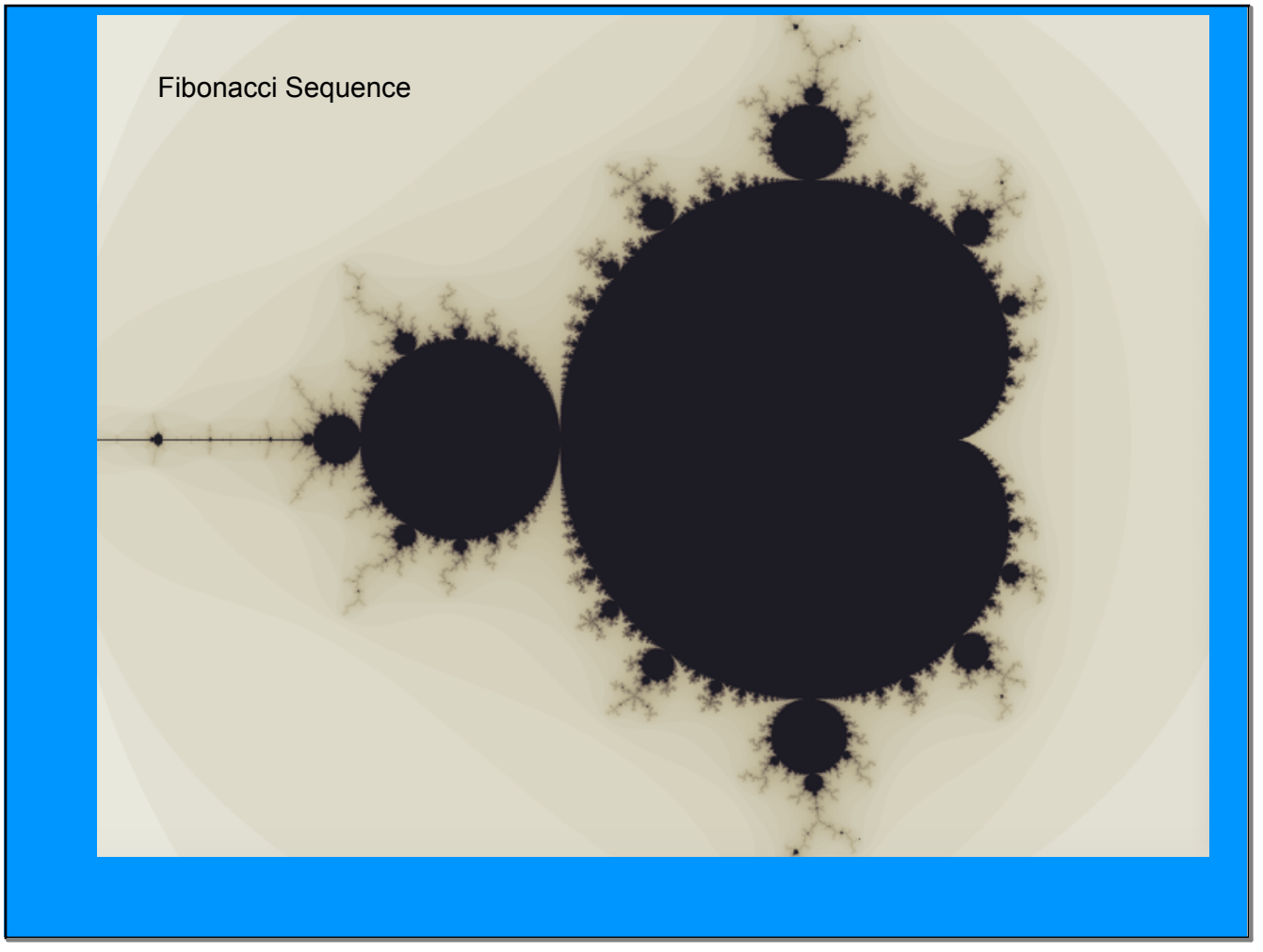

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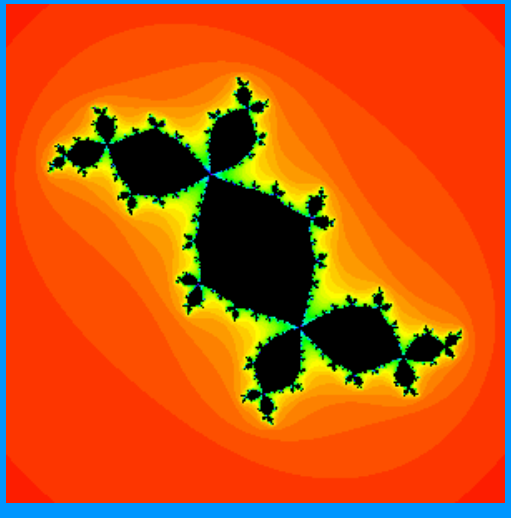
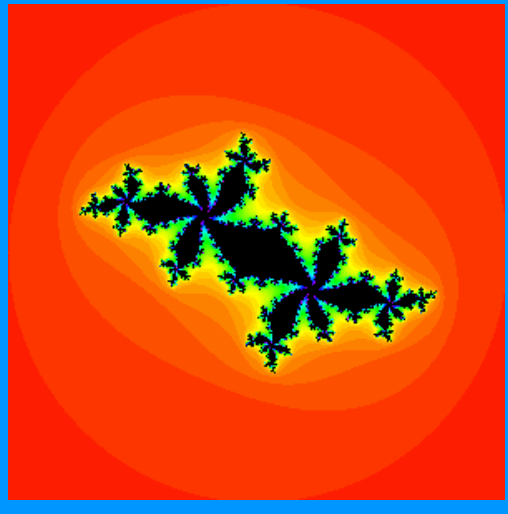
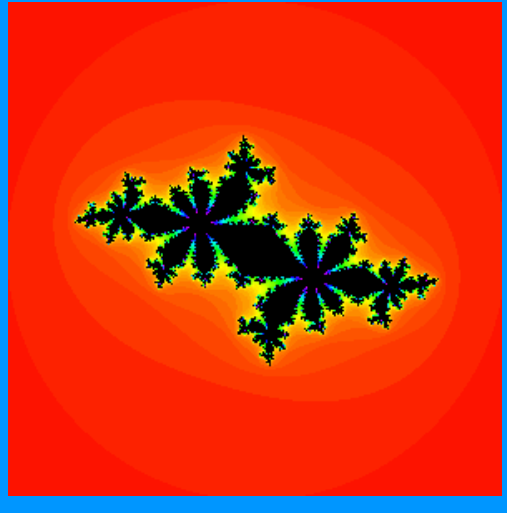
Julia Sets

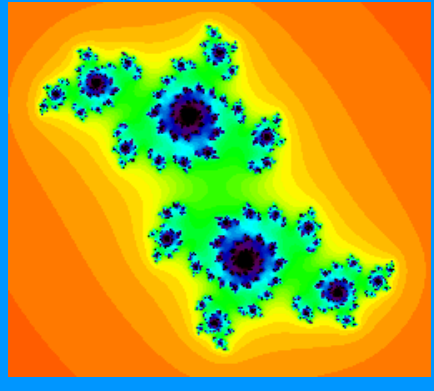
Mandelbrot

Julia

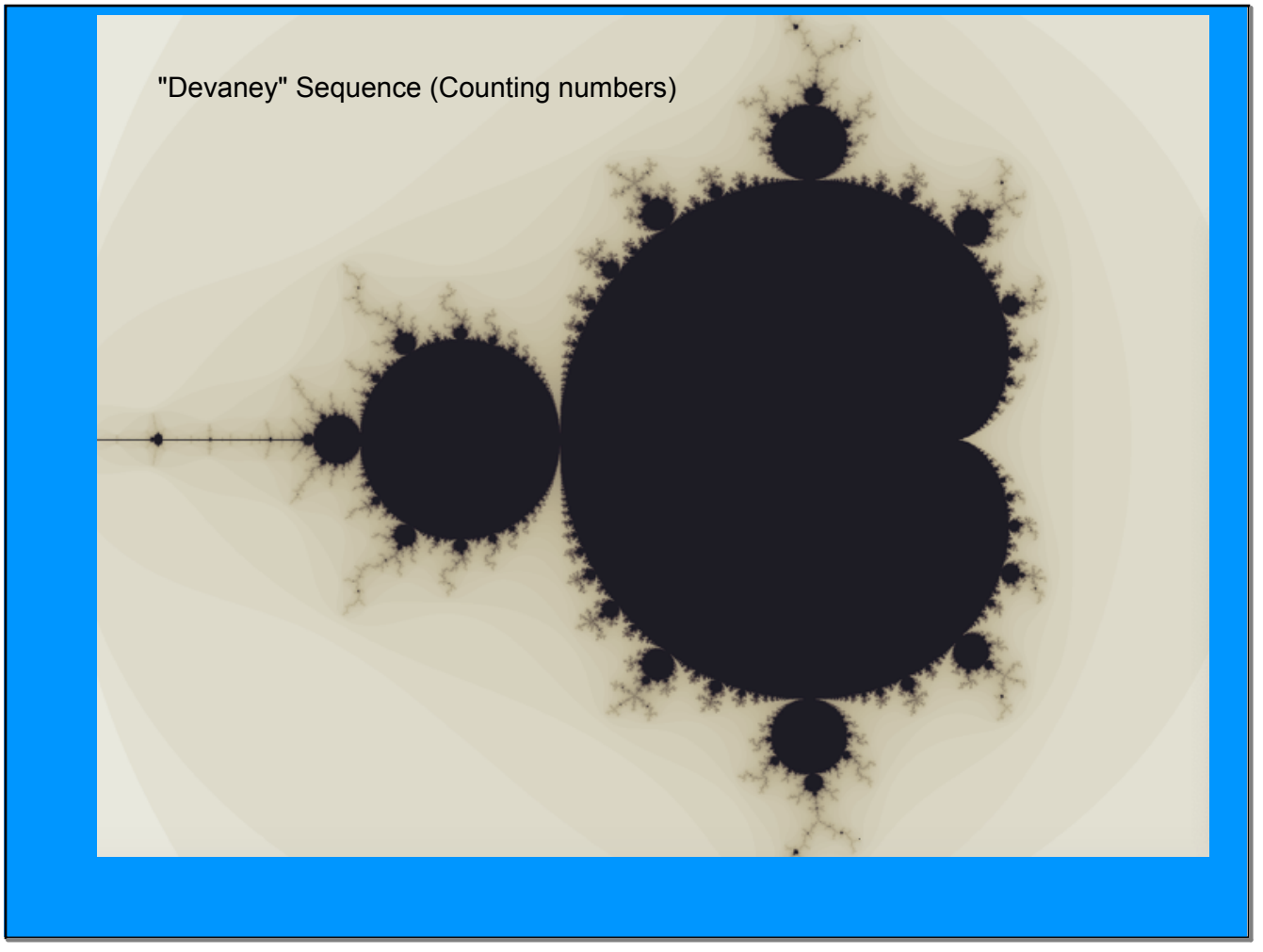








May 5, 2025



May 5, 2025