FRACTALS

Discovered 1980 – Benoit Mandelbrot

1920's – Gaston Julia

Dynamical systems – anything that moves or changes in time

* weather prediction
* stock market
* chemical reactions

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.

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

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

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

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

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

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

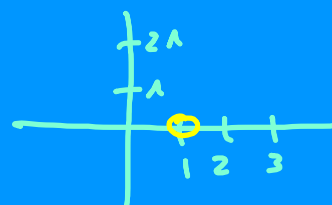
$f(26) = 26^2 + 1 = \text{big}$

$\text{big}^2 + 1 = \text{bigger}$

red — fast

yellow ... sorta fast

blue purple — slow



$1+0i$

seed value $x_1 = 0$

orbit — the list of #'s that result from iteration

Colors = how fast the orbit went to ∞

black = orbit does not go to ∞

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.

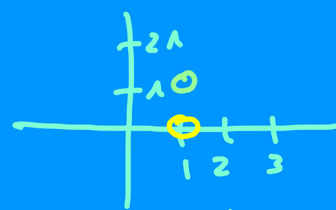
Calculator:

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

$0^2 + 1+i = 1+i$

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

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



$1+0i$

$1+i$

seed value $x_1 = 0$

Julia Set--Choose a c-value from the Mandelbrot Set and leave it fixed. Iterate using a different seed (starting) value. The seed value is the coordinate you are trying to color.

Activity 5: Iterate the function $f(x) = x^2 + (0 + 0i)$

Problem #1: $x_0 = 0.5$

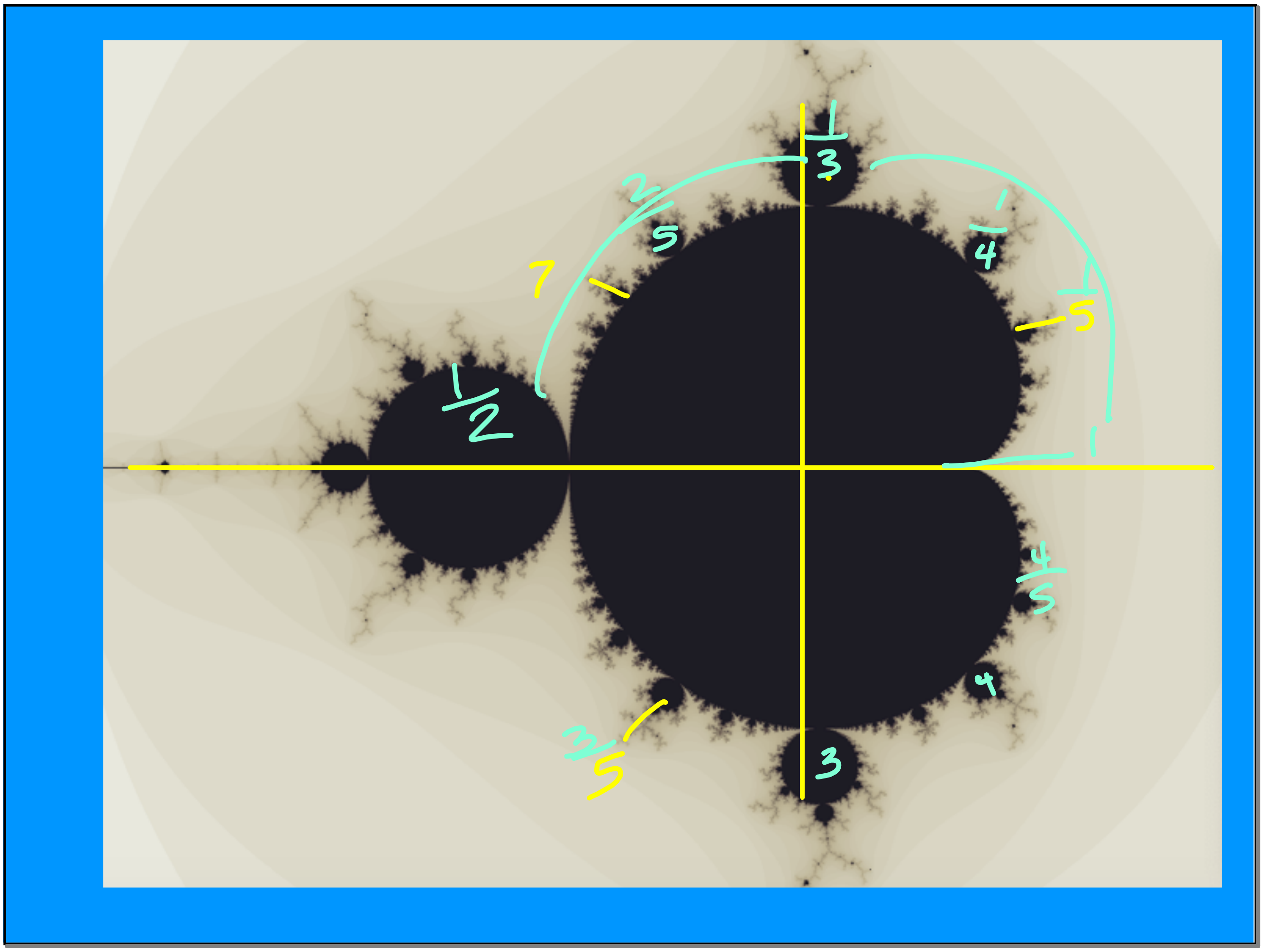
Calculator:

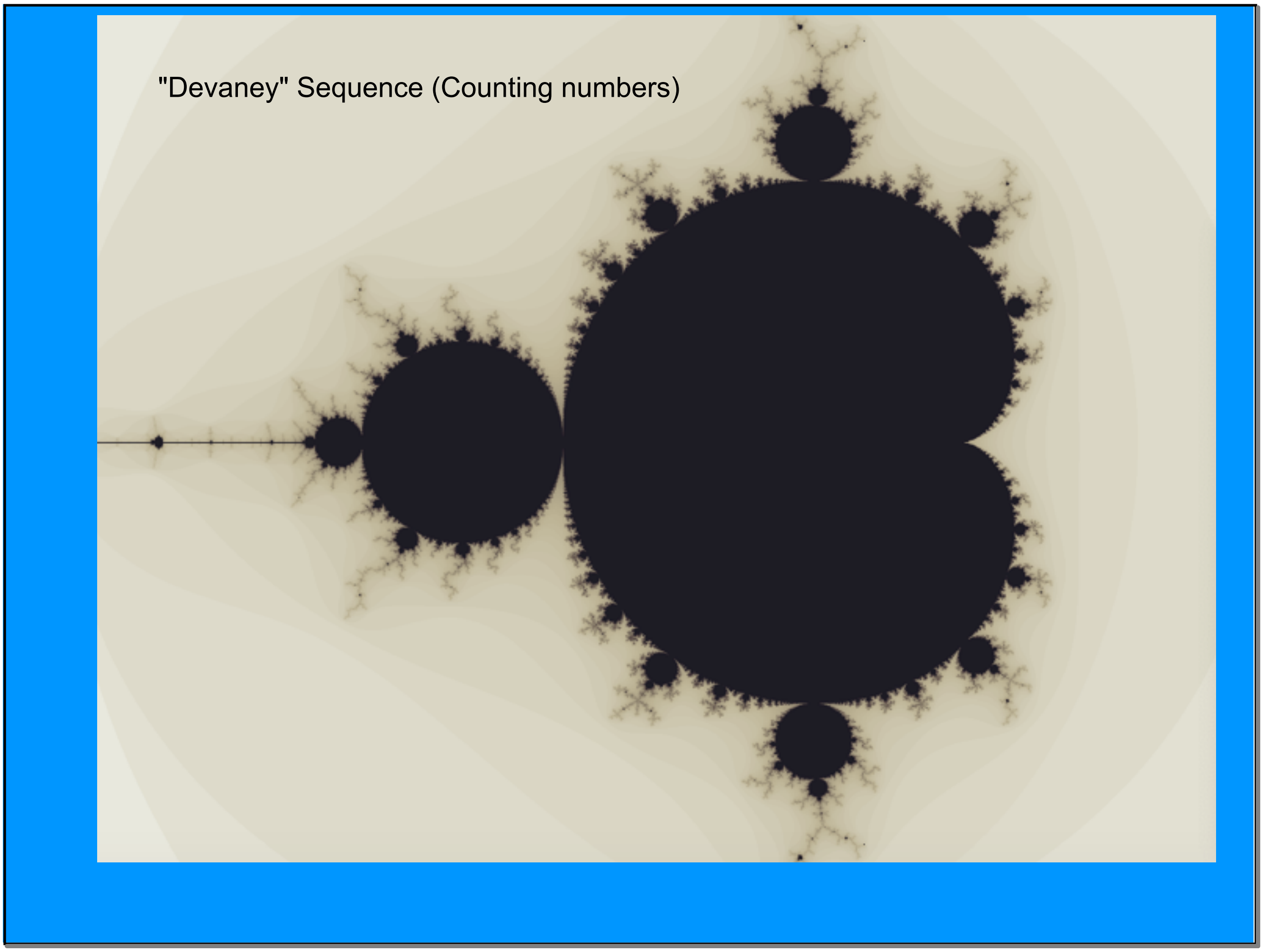
1) $x^2 + 0 \mid x = 0.5$

2) $x^2 + 0 \mid x = \text{Ans}$

For each problem, start the iteration with the x_0 value given.

May 11, 2023




"Devaney" Sequence (Counting numbers)