Both Julia sets and the Mandelbrot set are generated by iterating

$$z_{n+1} = z_n^2 + c$$

where z_n, z_{n+1}, and c are complex numbers.

Writing $z_n = x_n + i y_n$

$z_{n+1} = x_{n+1} + i y_{n+1}$

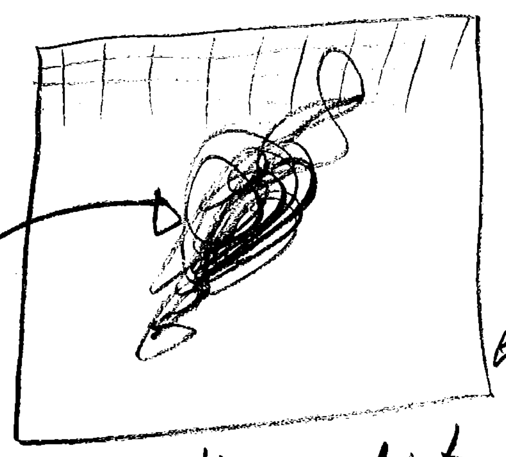
$c = a + ib$

Then $z_{n+1} = z_n^2 + c$ becomes

$$x_{n+1} = x_n^2 - y_n^2 + a$$

$$y_{n+1} = 2 x_n y_n + b$$

For each complex number c, there is a Julia set, K_c



K_c

z_0 values

For each pixel, the center is z_0. Generate

$z_1 = z_0^2 + c$

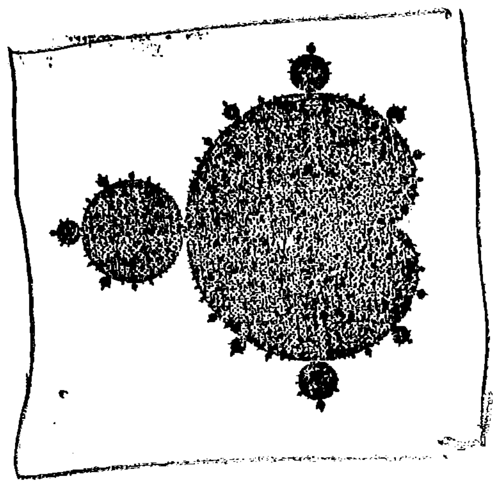
$z_2 = z_1^2 + c$

$\vdots$

$z_N = z_{N-1}^2 + c$

If all $z_1, z_2, \ldots, z_N$ lie with a distance of 2 from the origin, z_0 belongs to K_c.

For the Mandelbrot set, each pixel corresponds to a c value. For each c, begin the iteration with $z_0 = 0$, and compute $z_1 = z_0^2 + c$, $z_2 = z_1^2 + c, \ldots$ $z_N = (z_{N-1})^2 + c$. If all $z_1, z_2, \ldots, z_N$ lie within a distance of 2 from the origin, c belongs to M.



c values