

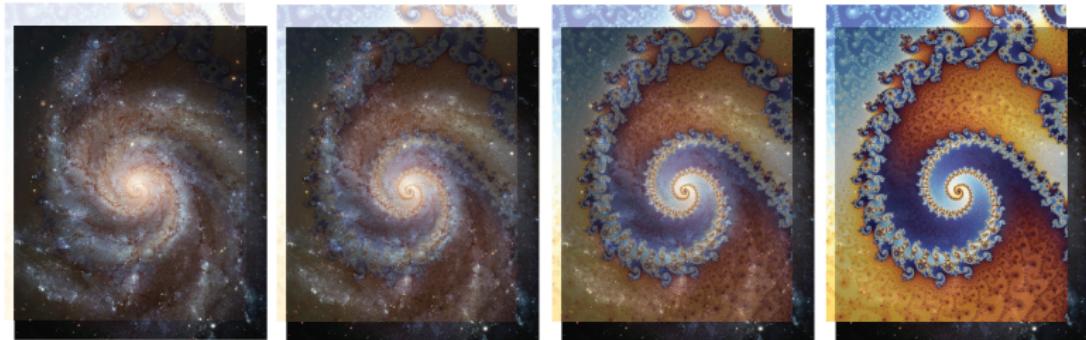
Pattern



Stefan Forcey, University of Akron

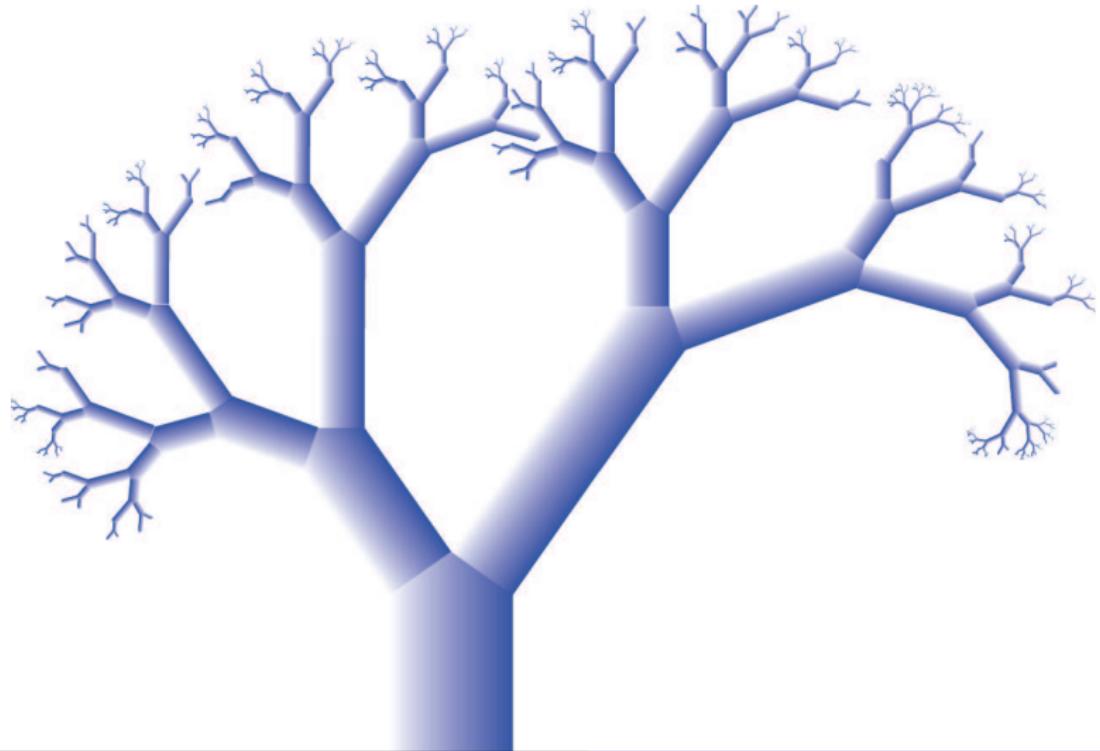


February 23, 2011



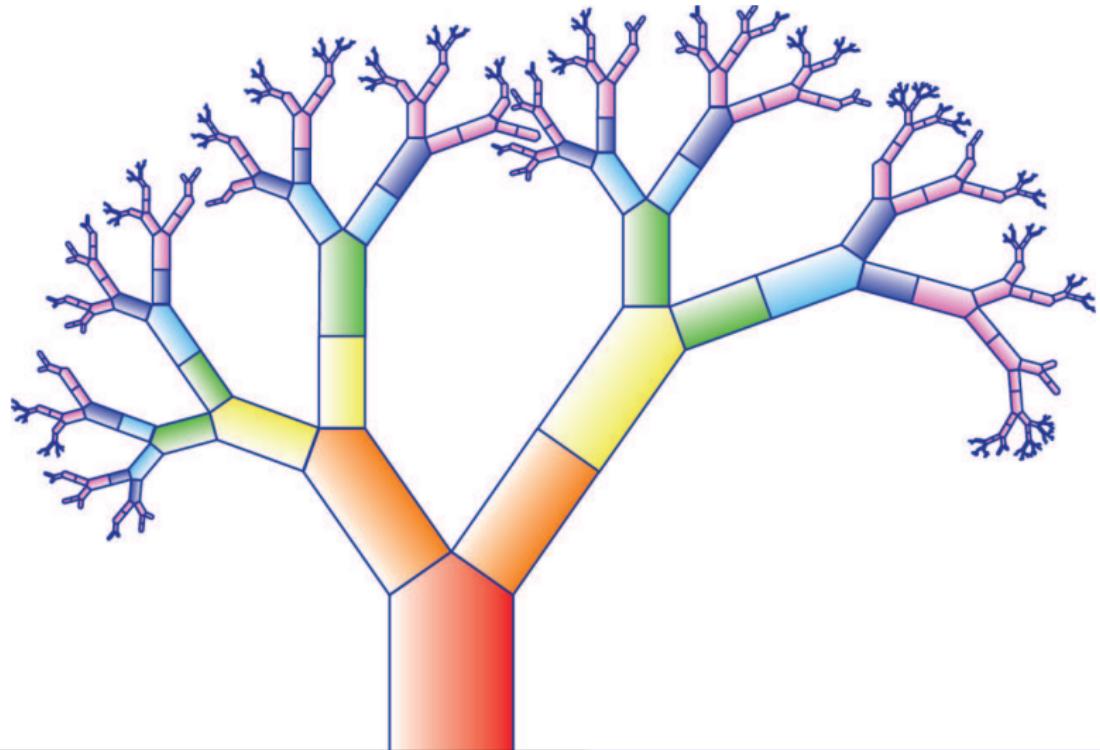
Fibonacci sequence.

1, 1, 2, 3, 5, 8, 13, ?



Fibonacci tree.

1, 1, 2, 3, 5, 8, 13, 21, 34, ...

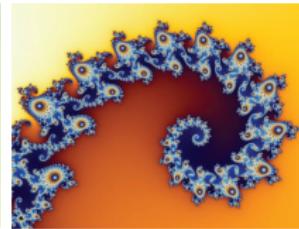


Logarithmic spiral.



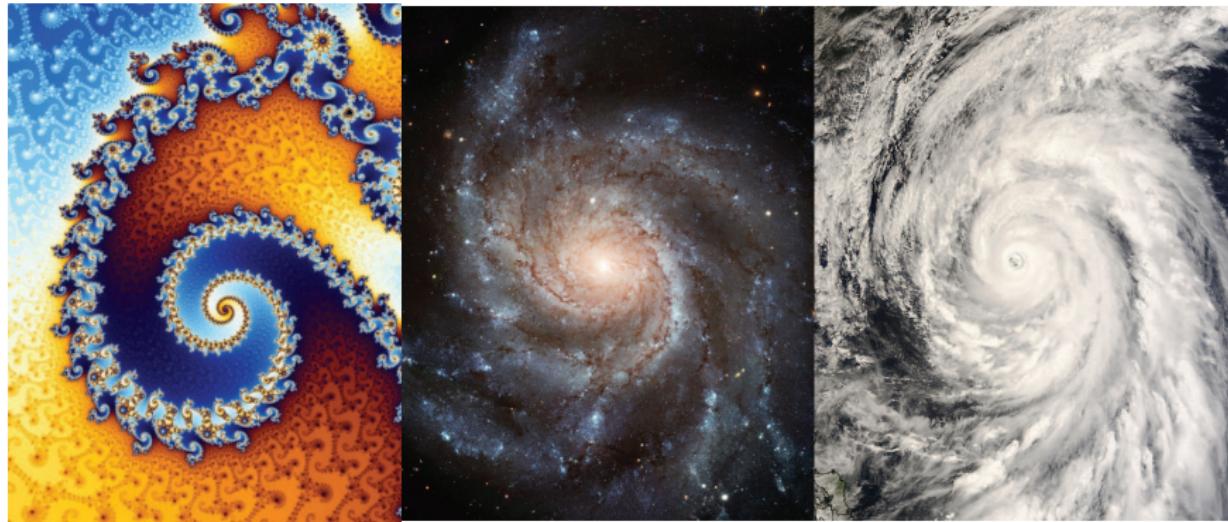
Logarithmic spiral.

$$r = e^{\theta}.$$



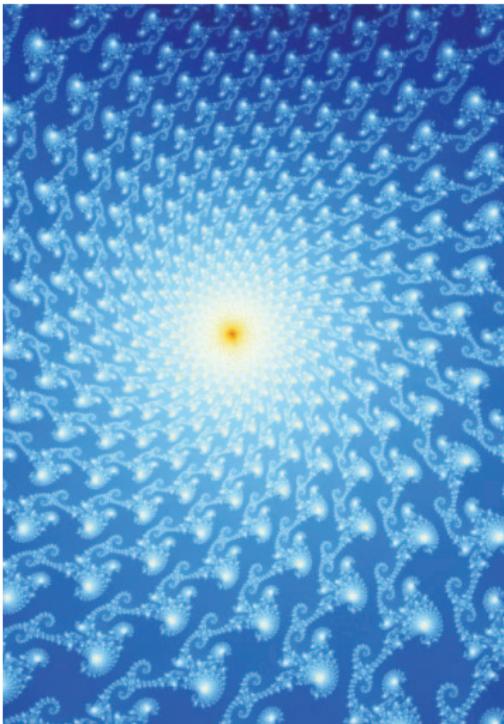
Logarithmic spiral.

$$\ln r = \theta.$$

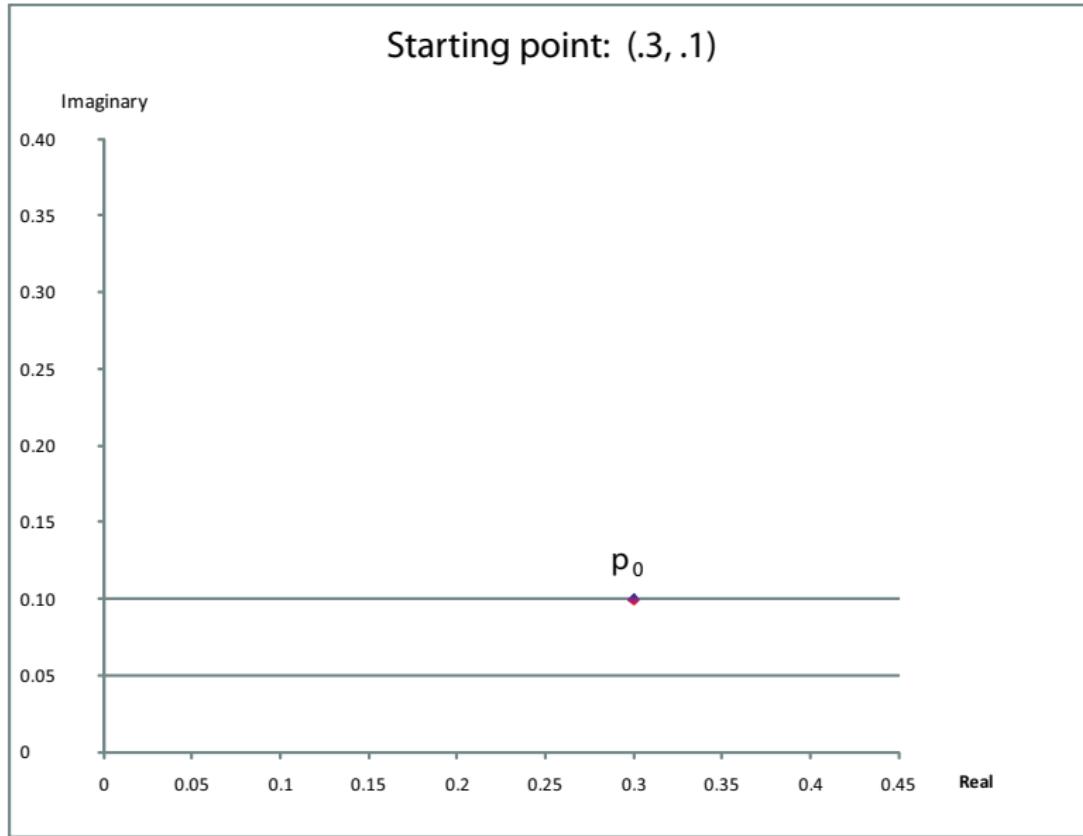


Logarithmic spiral.

$$\ln r = \theta.$$

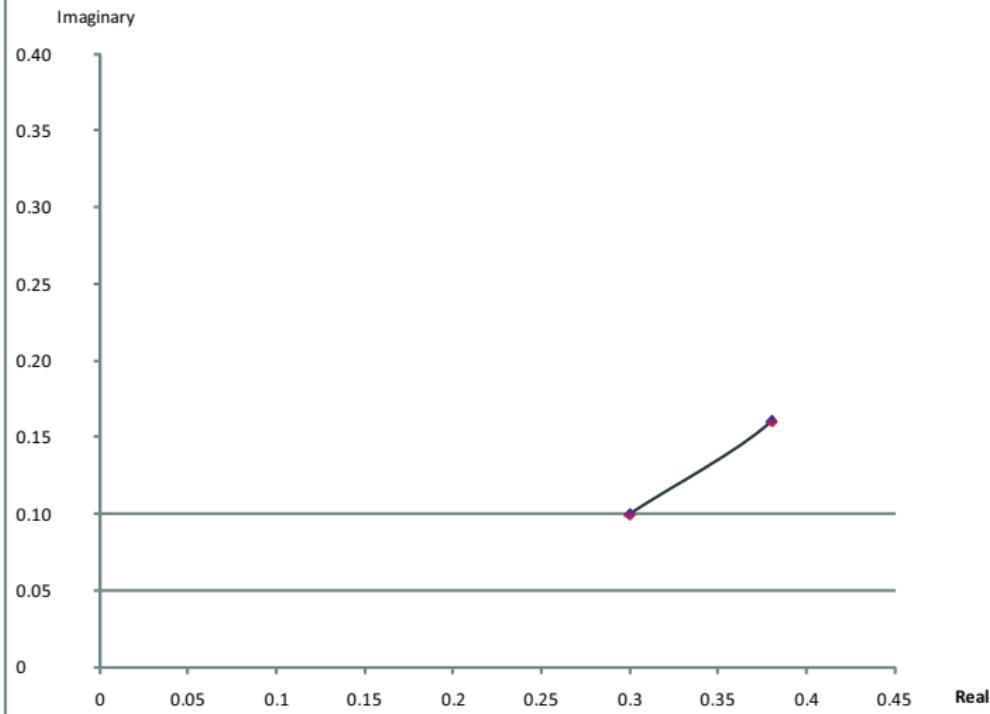


Mandelbrot sequence: square and add starting point. $p \mapsto p^2 + p_0$



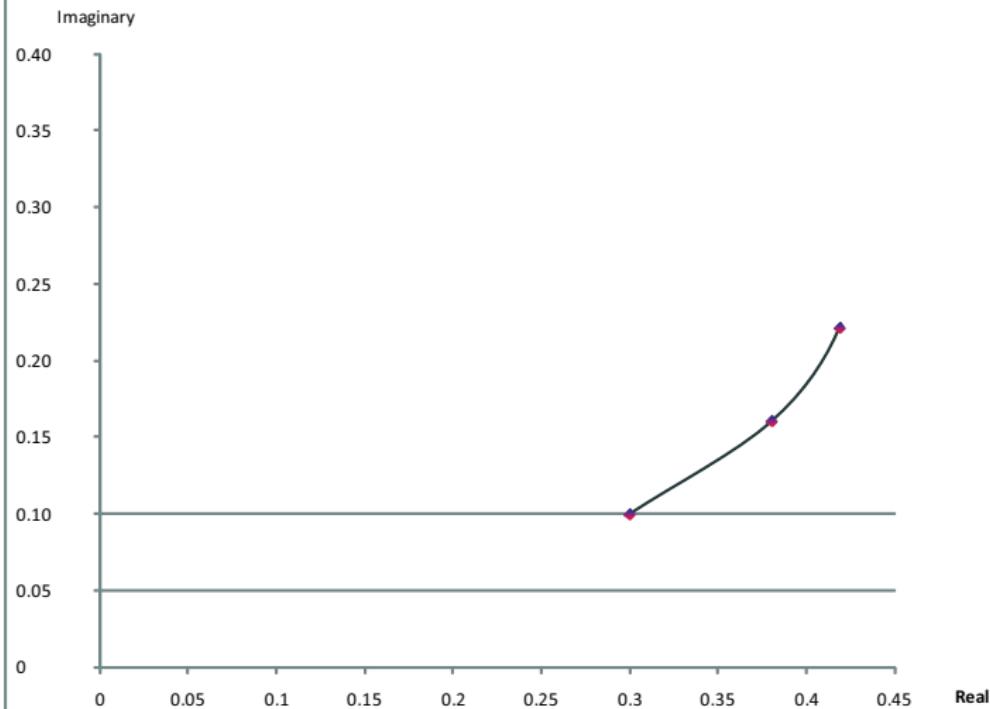
$$\text{Mandelbrot } p \mapsto p^2 + p_0$$

Starting point: (.3,.1)



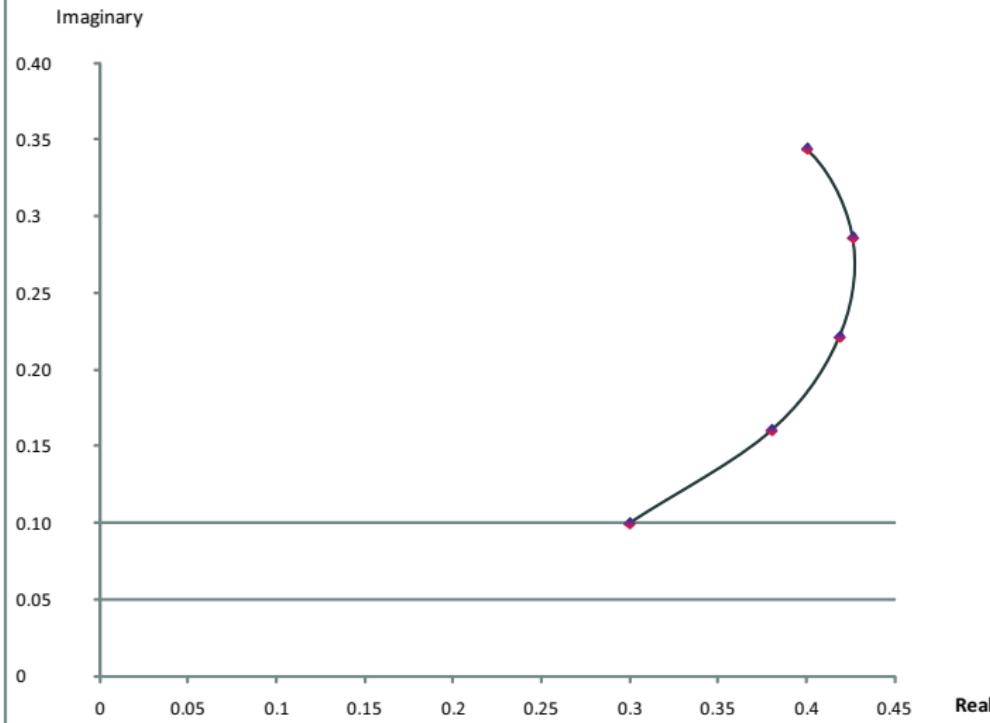
$$\text{Mandelbrot } p \mapsto p^2 + p_0$$

Starting point: (.3,.1)



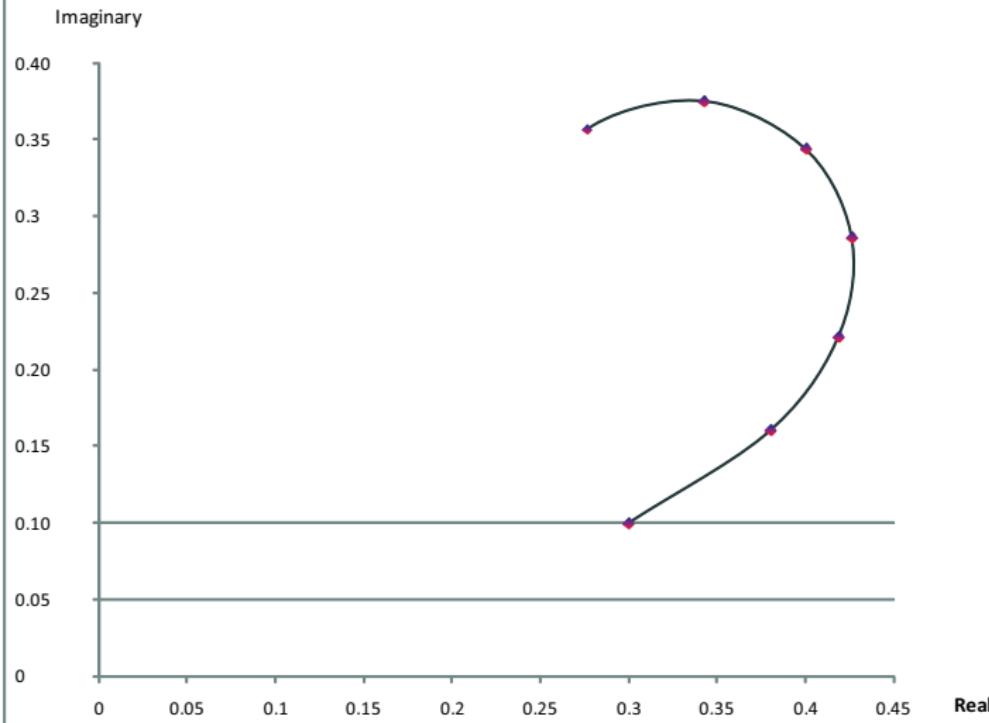
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: (.3,.1)



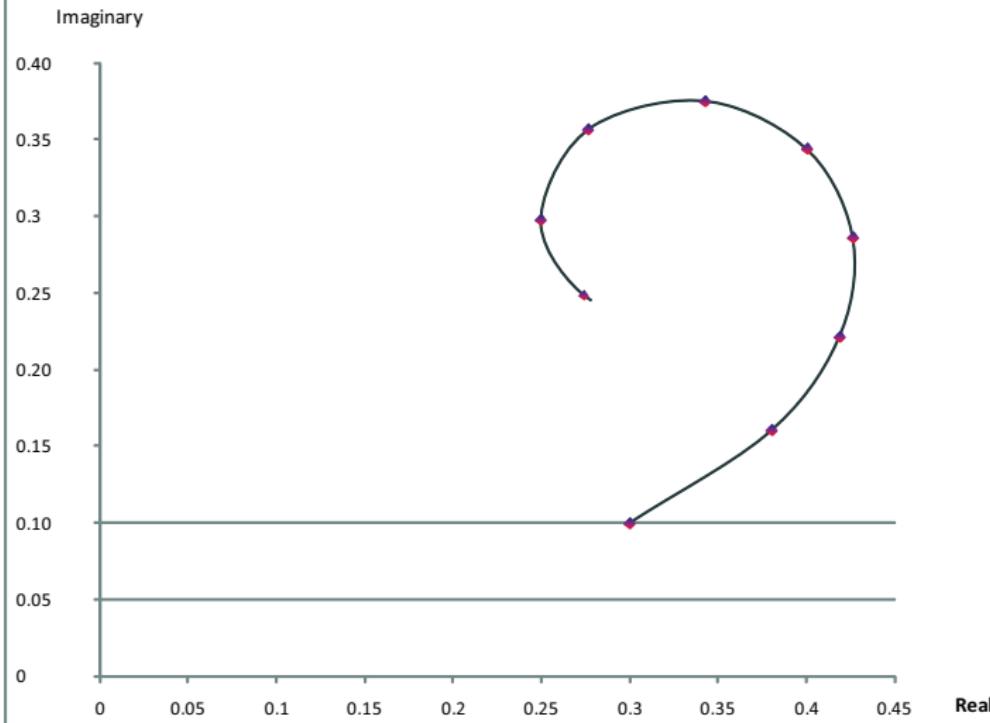
$$\text{Mandelbrot } p \mapsto p^2 + p_0$$

Starting point: (.3,.1)

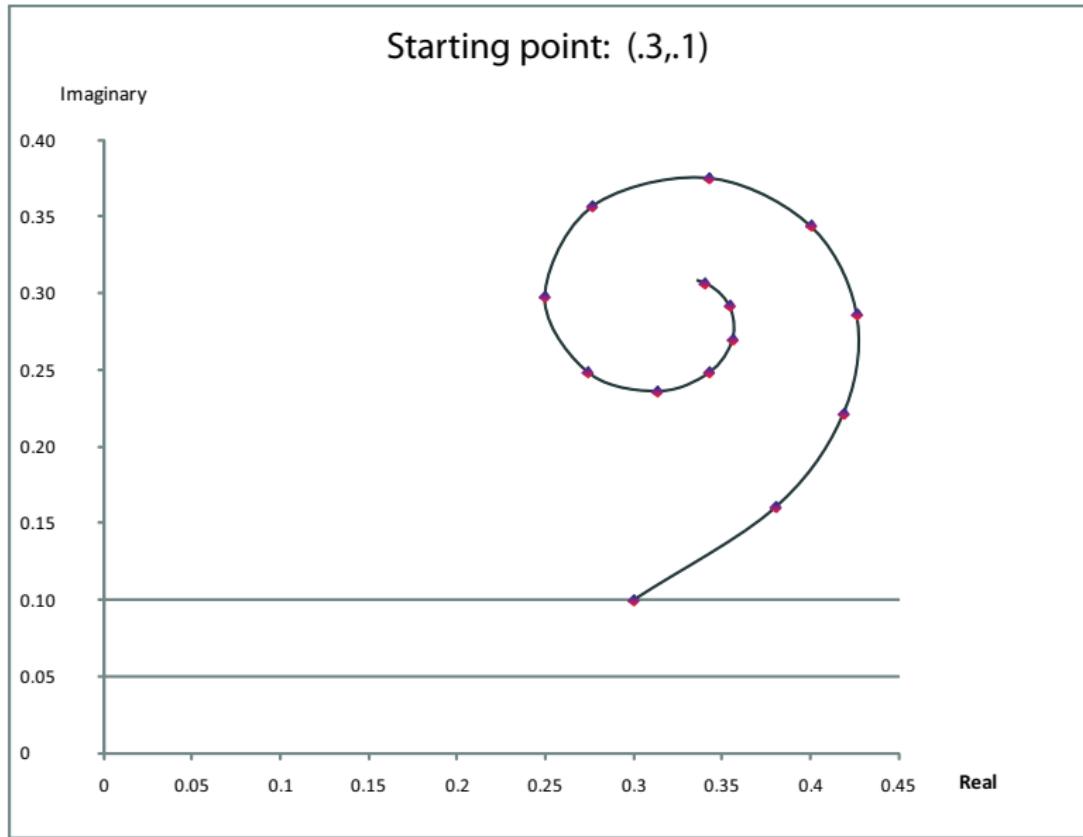


Mandelbrot $p \mapsto p^2 + p_0$

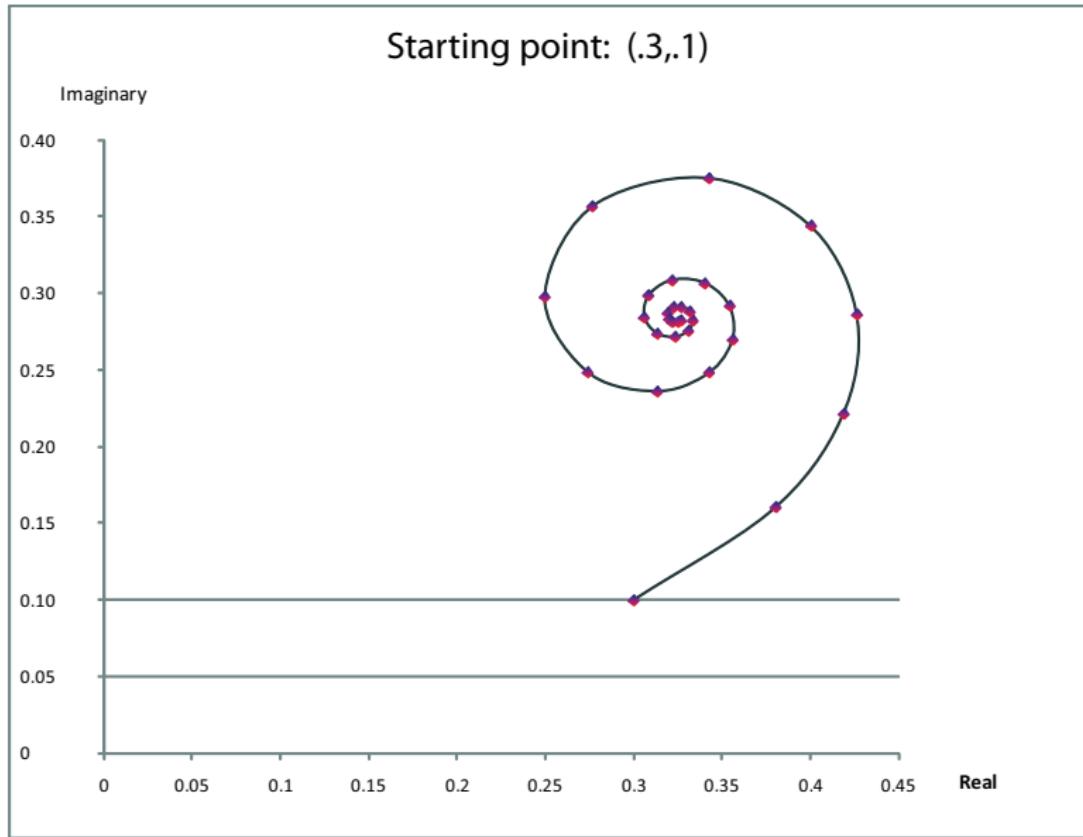
Starting point: (.3,.1)



Mandelbrot $p \mapsto p^2 + p_0$

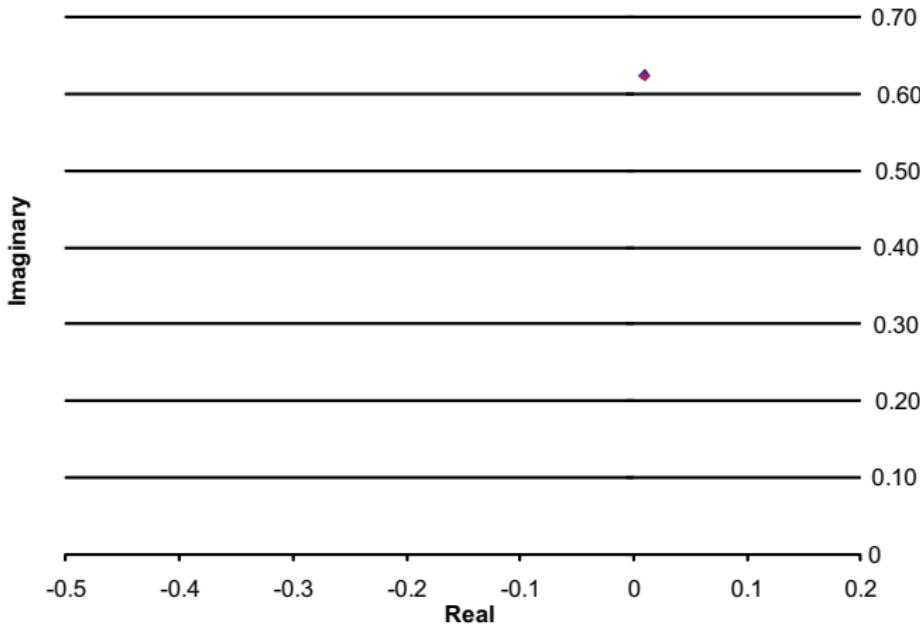


Mandelbrot $p \mapsto p^2 + p_0$



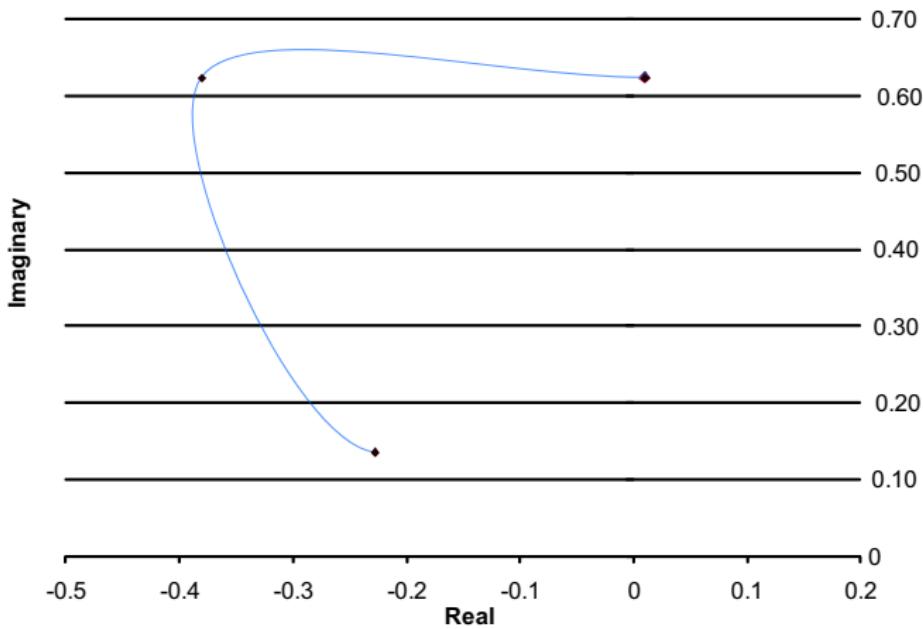
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: (0, 5/8)



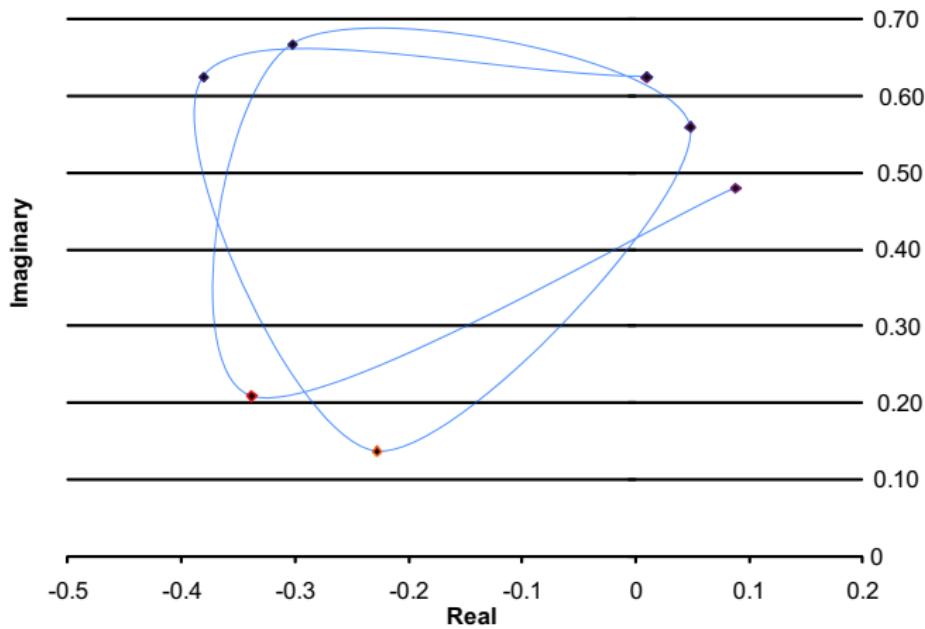
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: $(0, 5/8)$



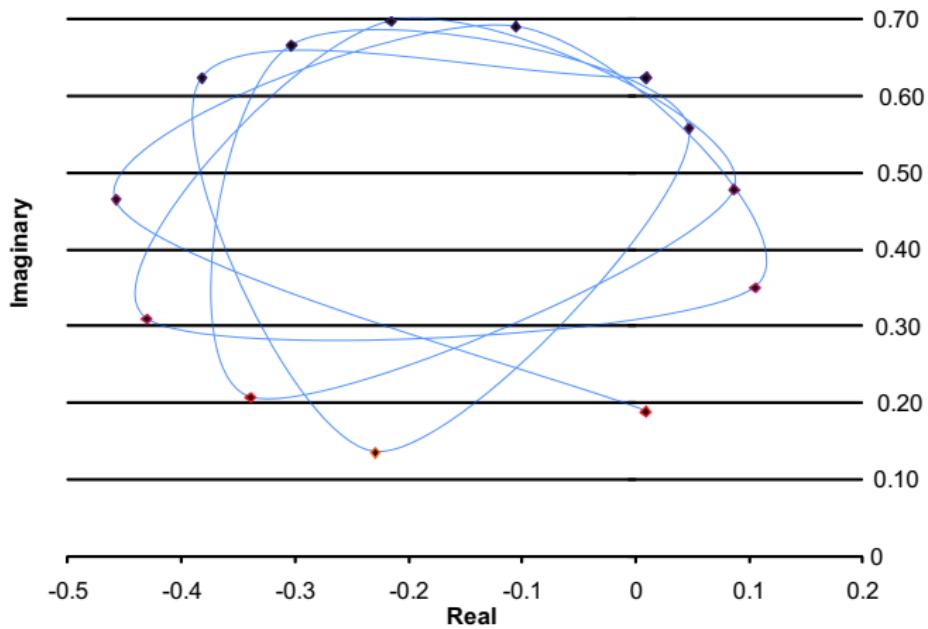
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: $(0, 5/8)$



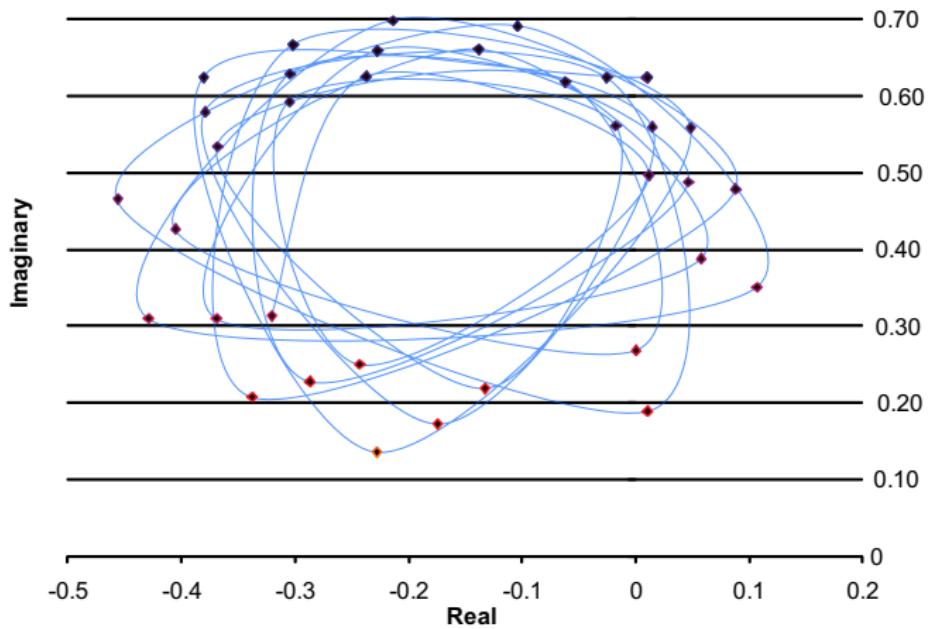
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: $(0, 5/8)$



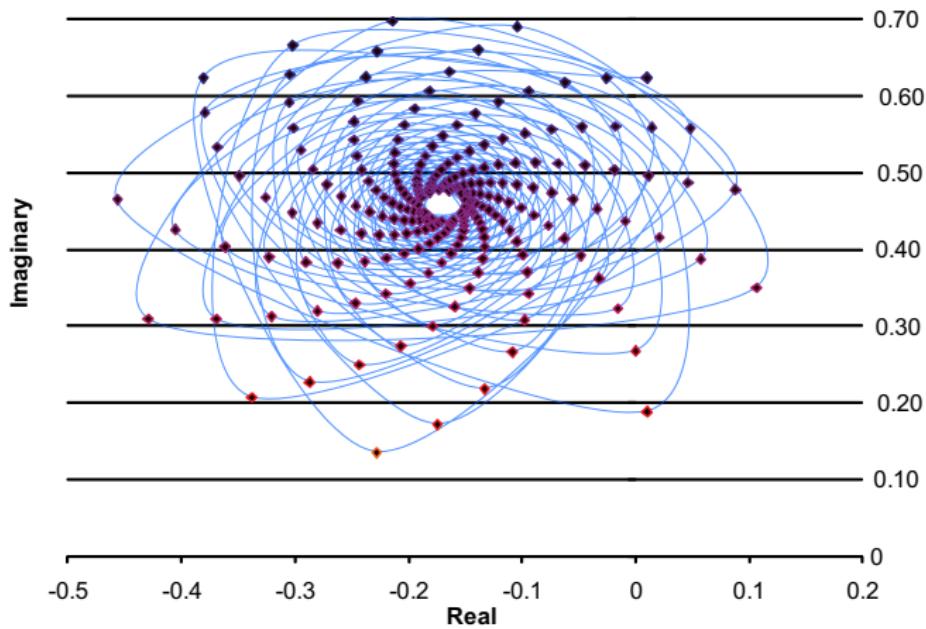
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: $(0, 5/8)$



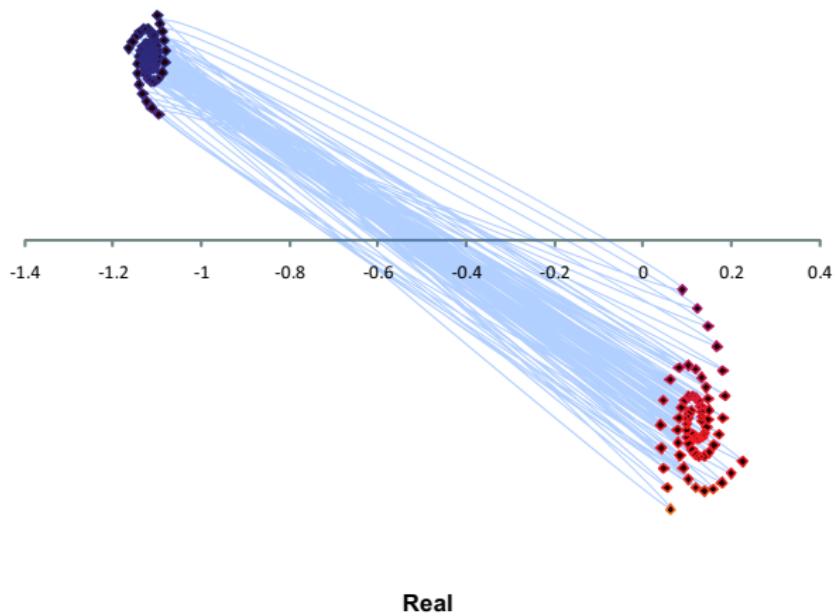
Mandelbrot $p \mapsto p^2 + p_0$

Starting point: $(0, 5/8)$

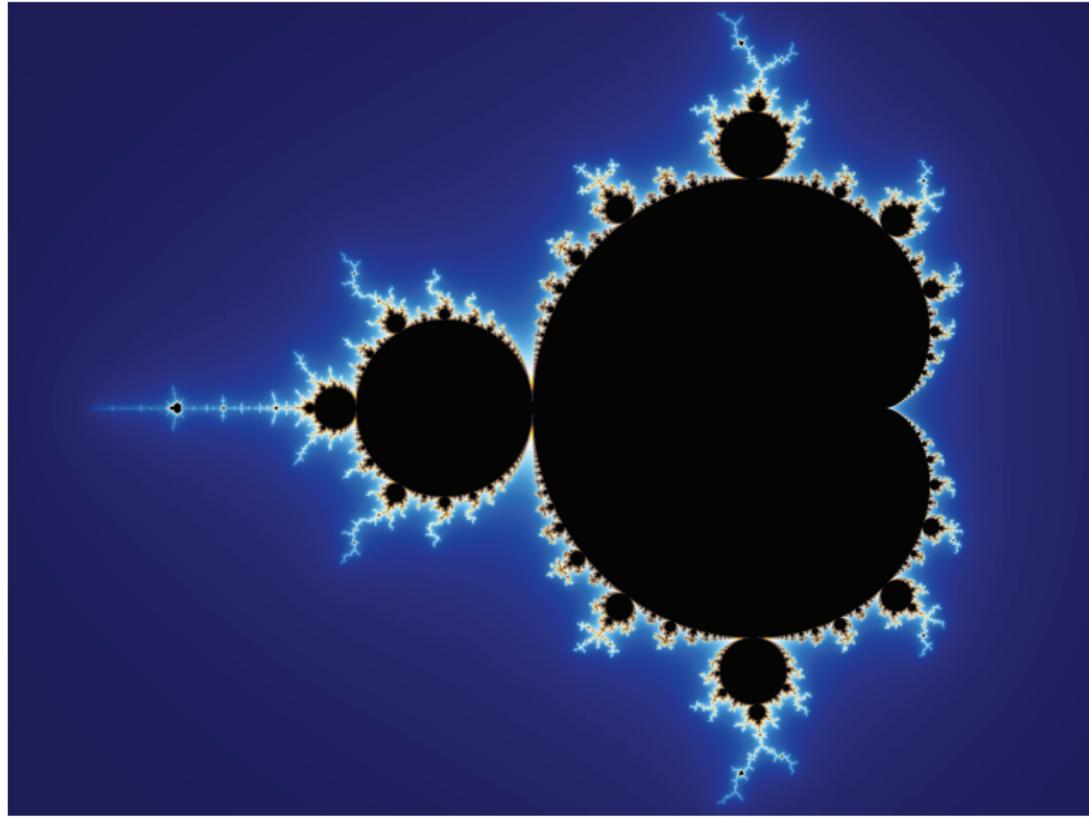


Mandelbrot $p \mapsto p^2 + p_0$

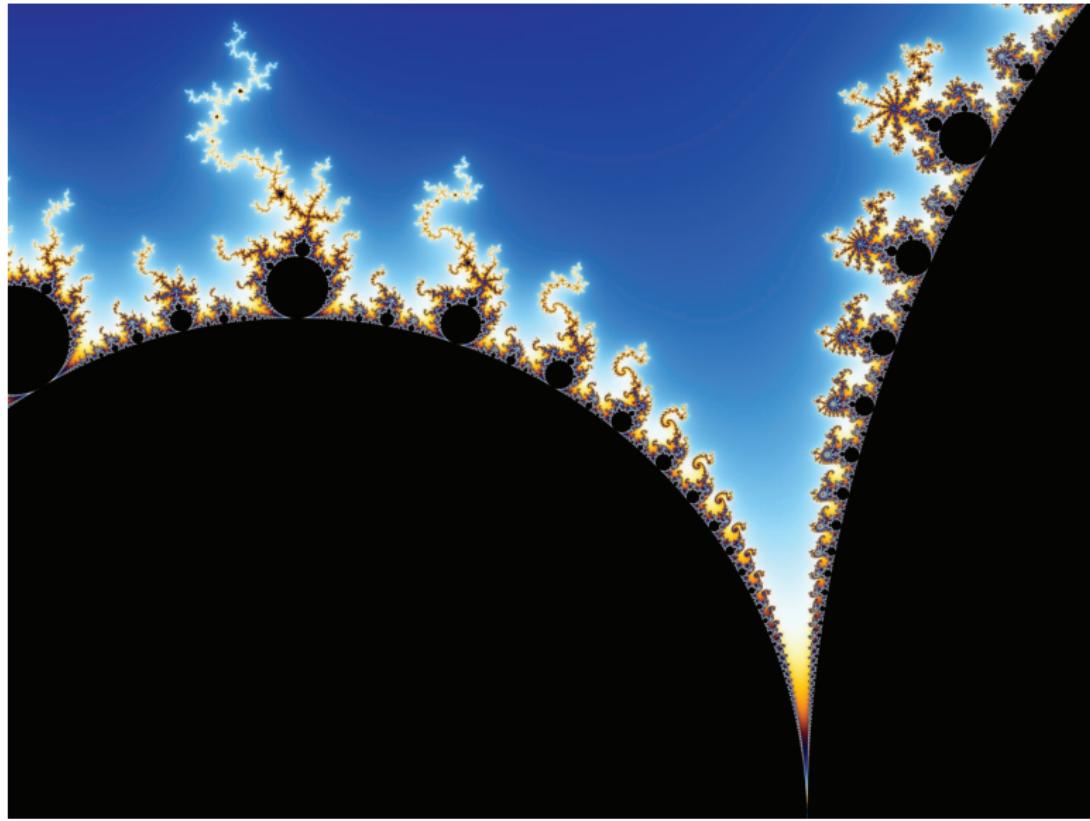
Starting point: (-1.1, .22)



Mandelbrot set.

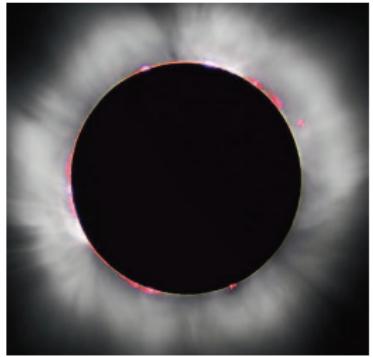
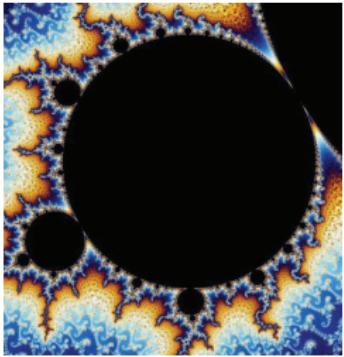


Mandelbrot set.

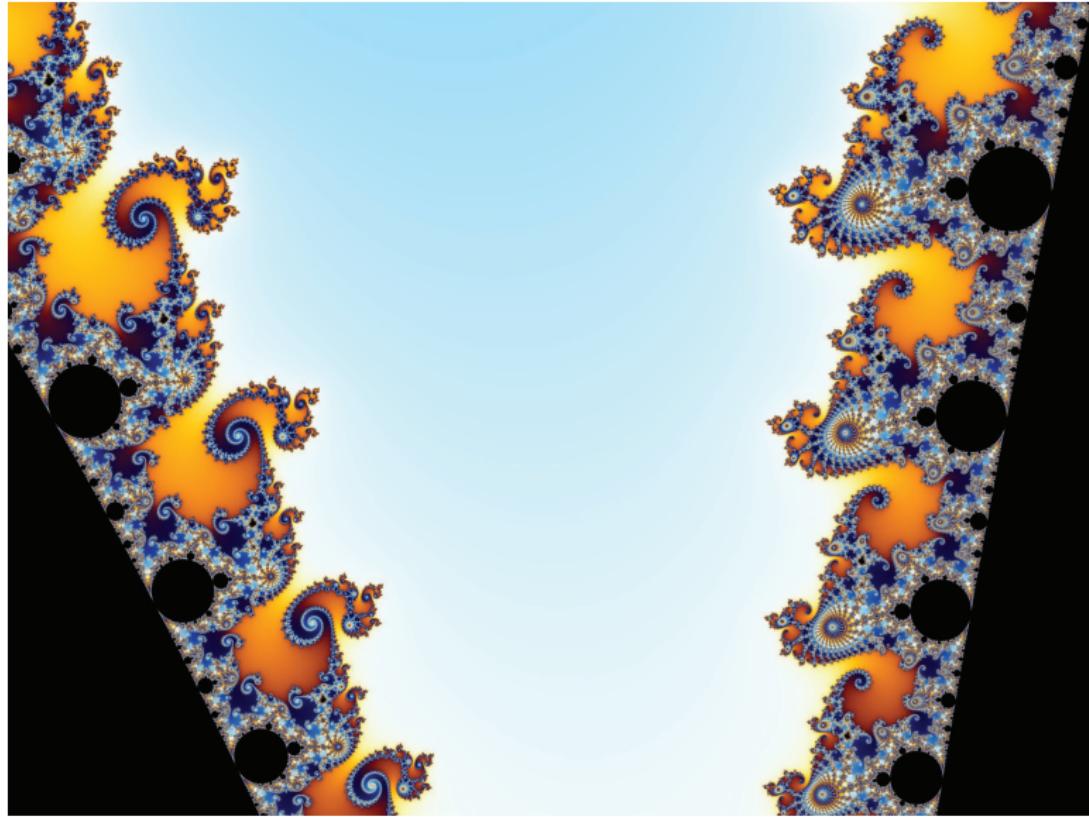


Fractal

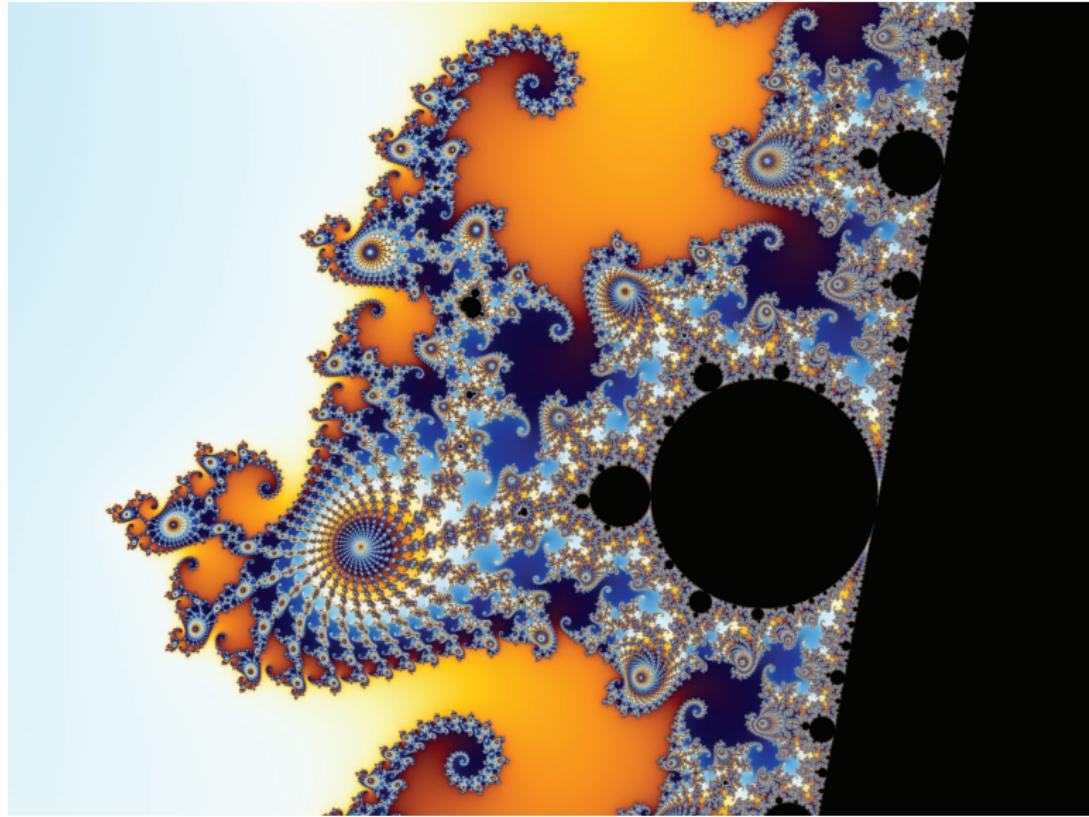
Victoria crater.



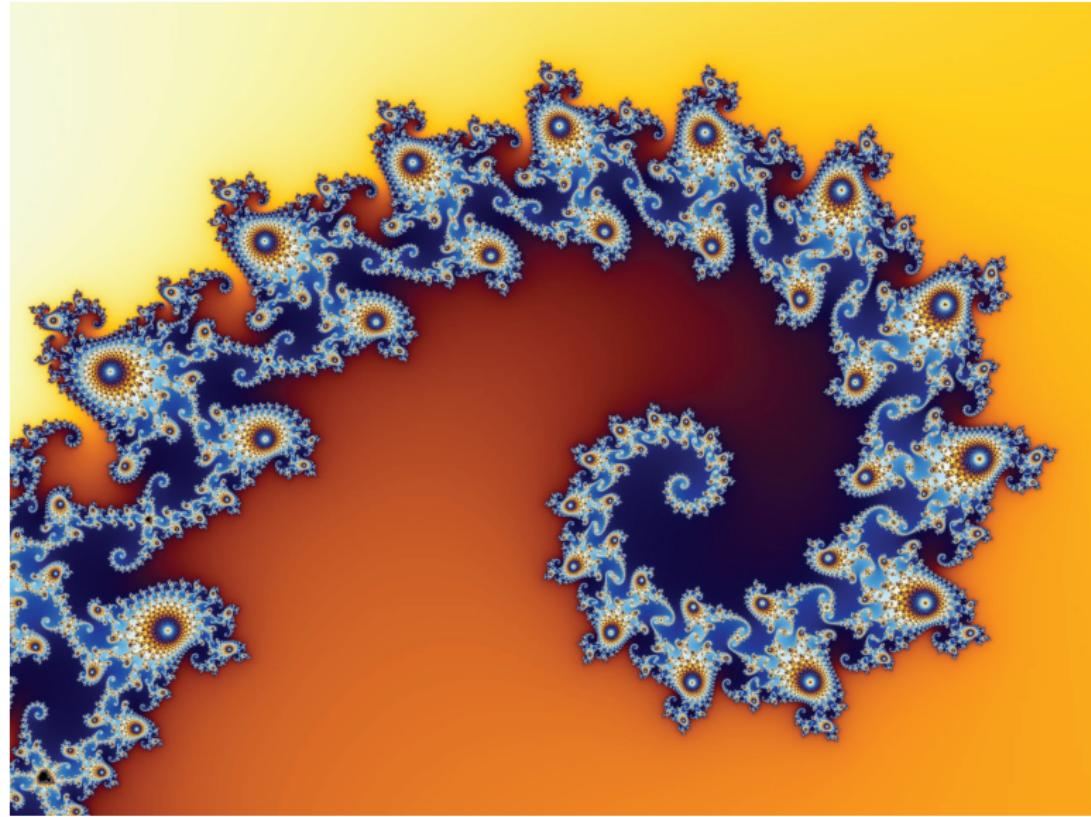
Mandelbrot set.



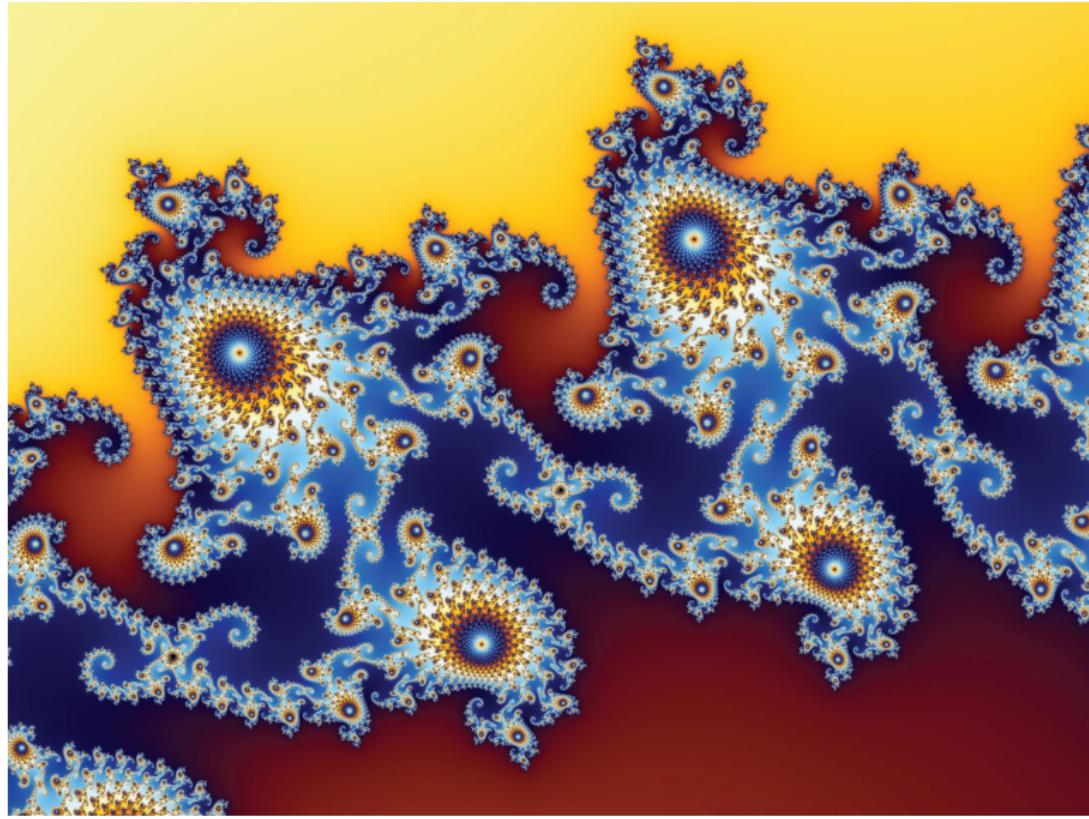
Mandelbrot set.



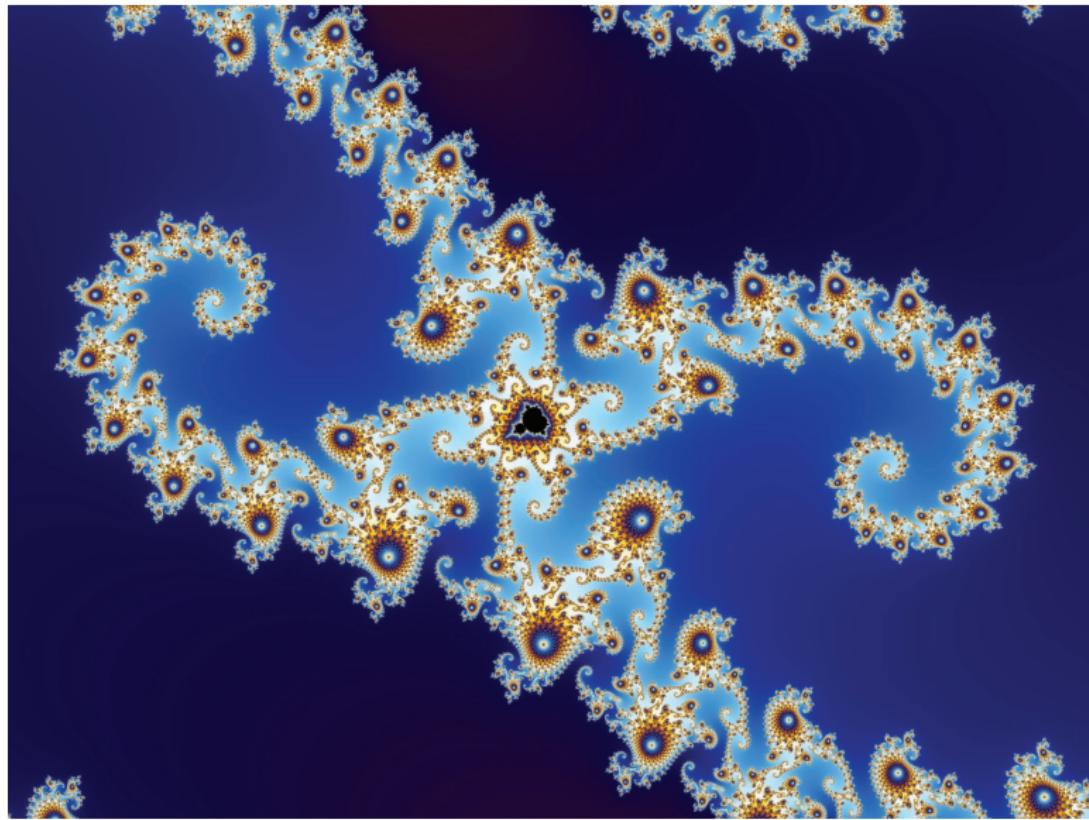
Mandelbrot set.



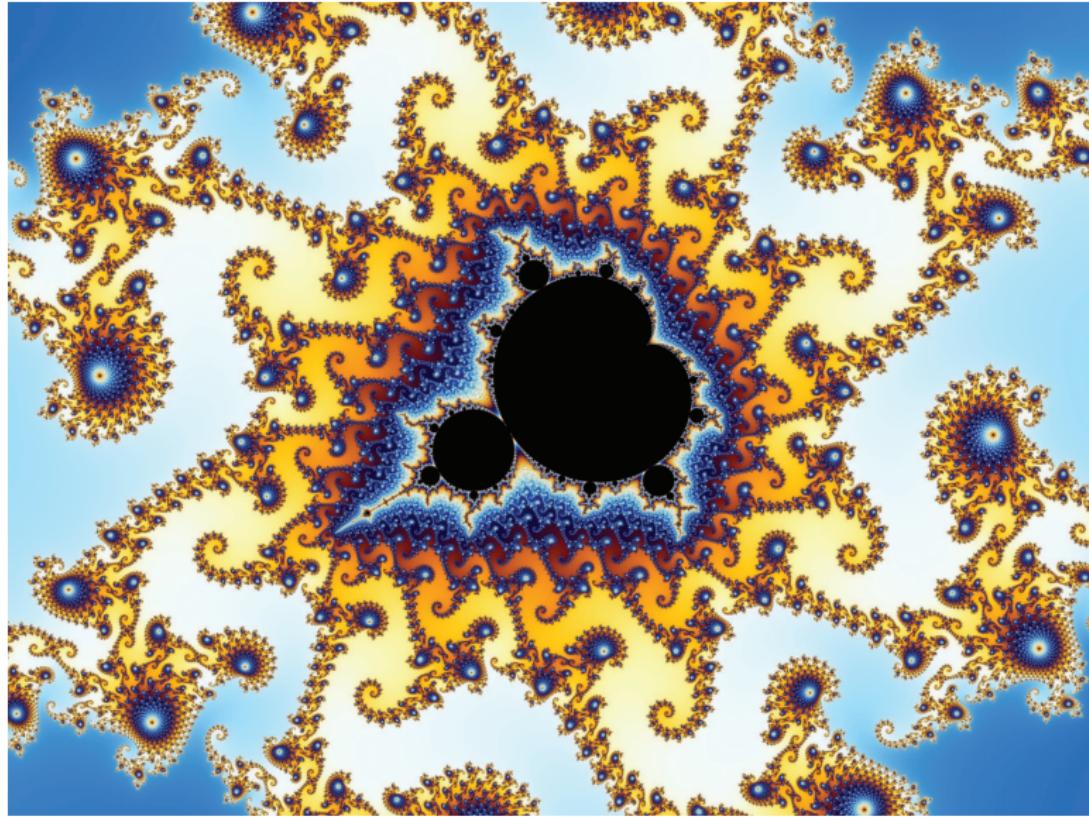
Mandelbrot set.



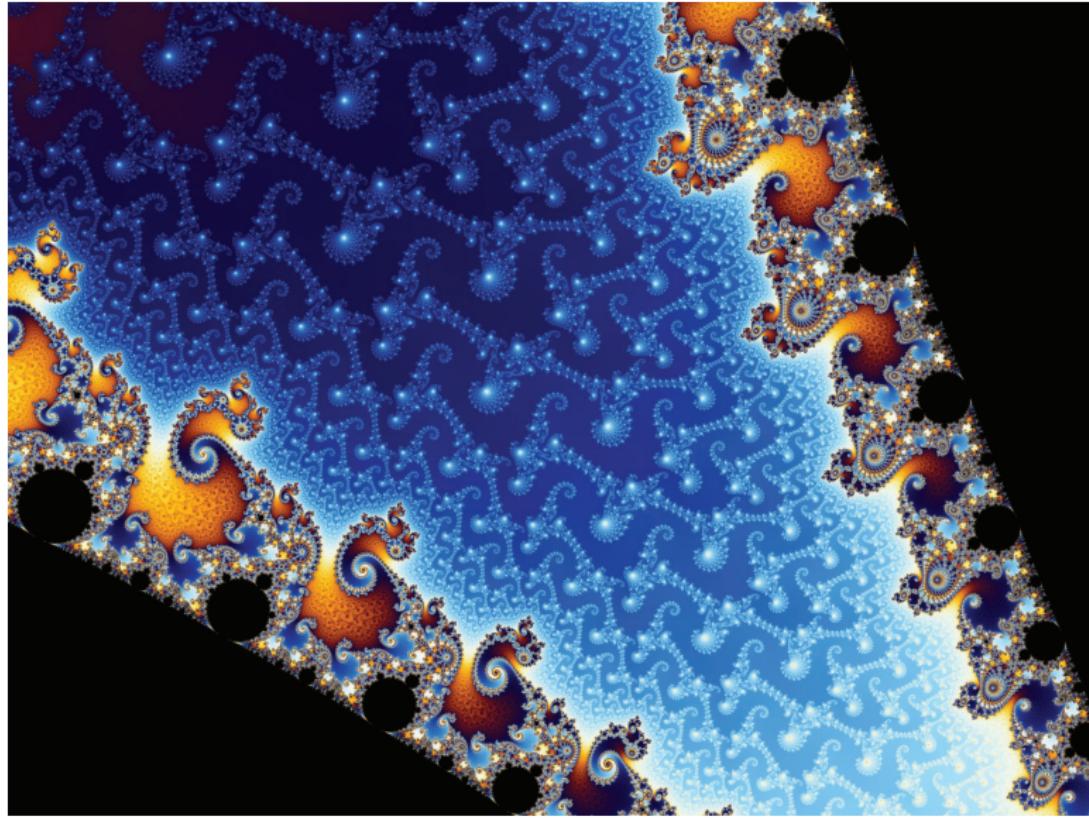
Mandelbrot set.



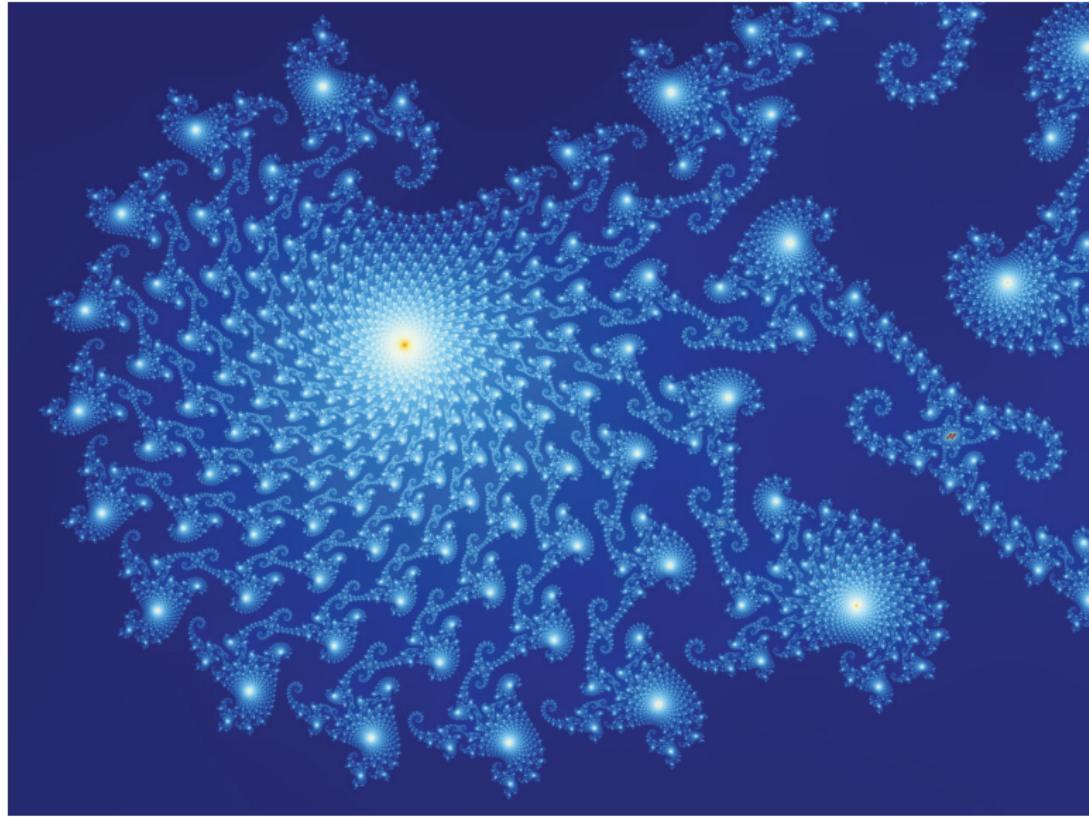
Mandelbrot set.



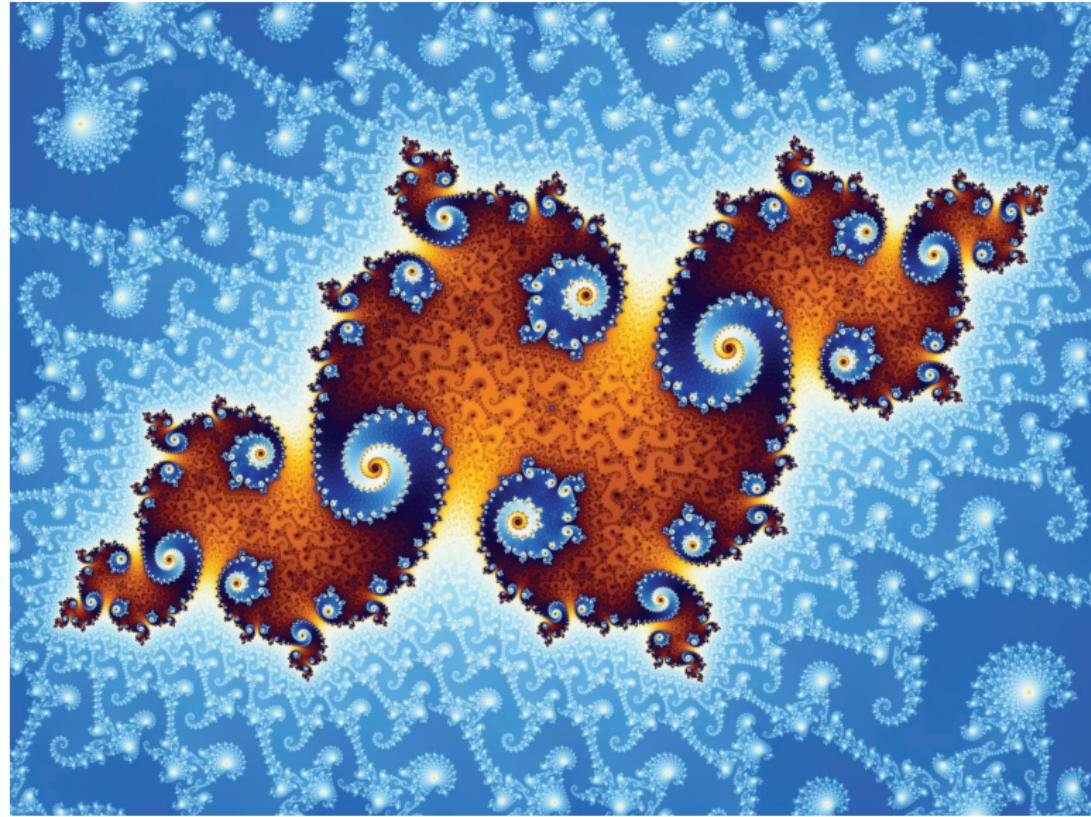
Mandelbrot set.



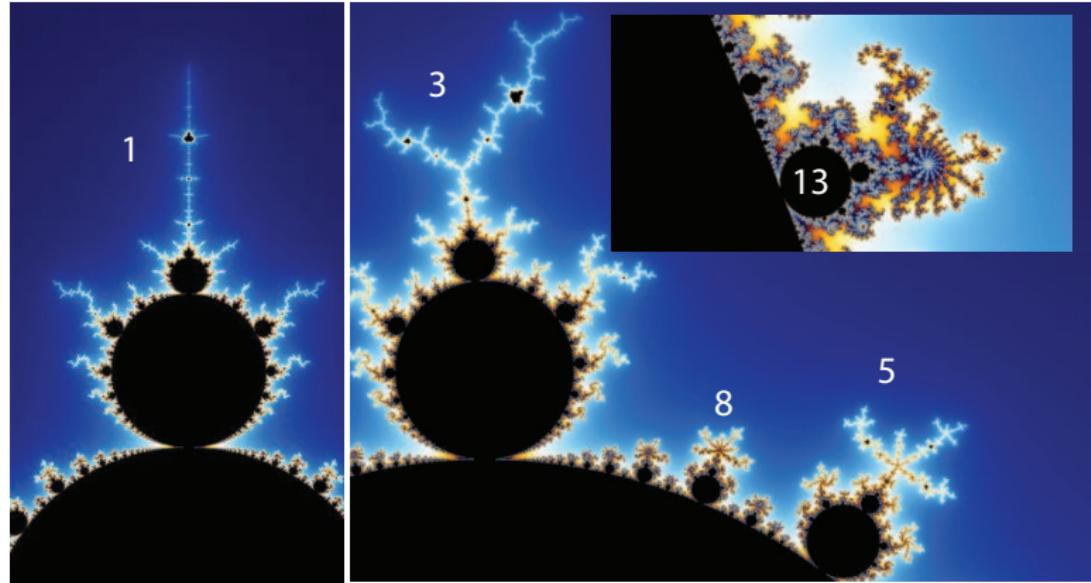
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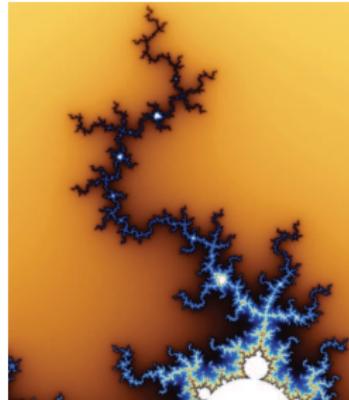
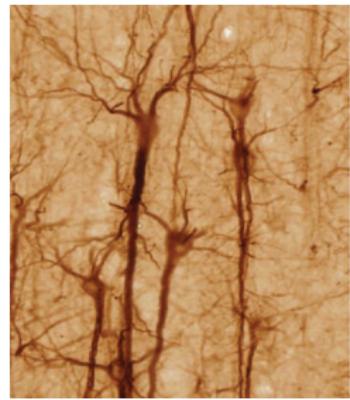
Mandelbrot set.



Fibonacci again!



Trees



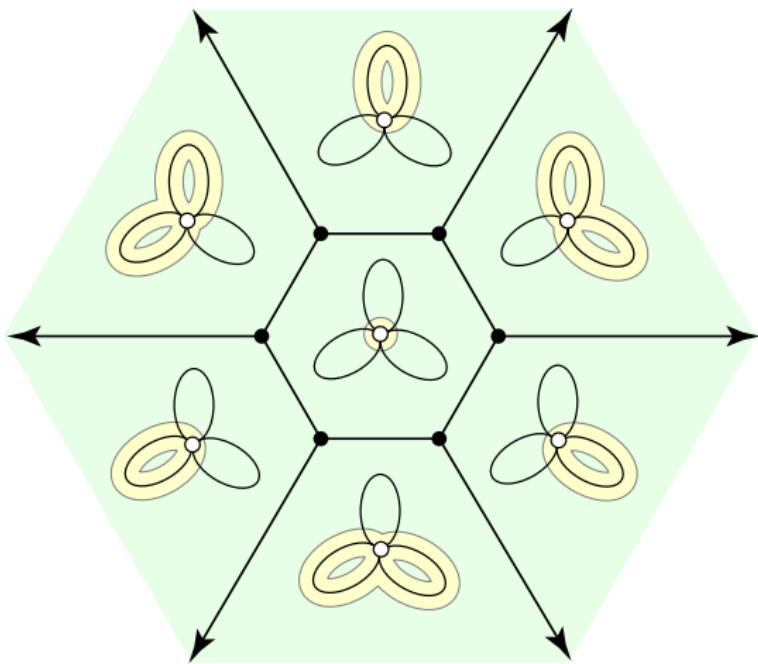
Trees



Trees



Thanks!



There are many more patterns to be discovered than there are
already known...