

Generating the Julia Set with Mathcad

Parameters

Number of pixels in x and y direction	$N := 500$
Bounds of the complex plane to iterate over	$realLower := -0.75$ $realUpper := 0.75$ $imagLower := -0.75$ $imagUpper := 0.75$
Maximum iterations for each point	$maxIter := 500$
Bailout value	$bailout := 2$

Calculations

Generate matrix of complex numbers

$$i := 0..N \quad j := 0..N$$

$$imag_{i,j} := realLower + \frac{(realUpper - realLower)}{N} \cdot j + \left[imagLower + \frac{(imagUpper - imagLower)}{N} \cdot i \right] \cdot i$$

Iterate over the complex plane. Change the c value, and possibly the polynomial in z for different effects

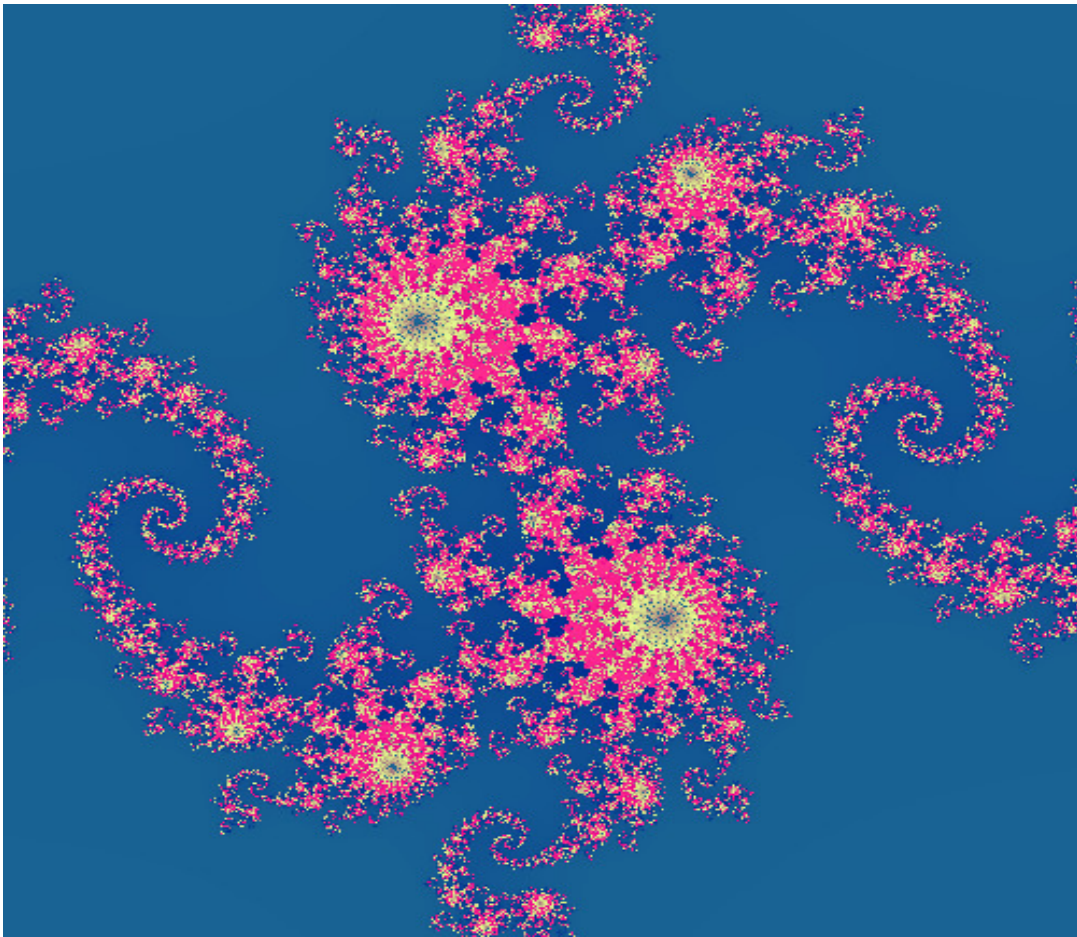
```

Z := | c ← -0.8 + 0.1566i
      | for i ∈ 0..N
      |   for j ∈ 0..N
      |     z ← imagi,j
      |     for iter ∈ 1..maxIter
      |       z ← z2 + c
      |       if |z| > bailout
      |         iterationsi,j ← iter
      |         break
      |     return iterations
  
```

Color each point with custom RGB values. Change the parameters and functions in this program for different coloring effects - for example, try using trig or log functions for entirely different effects

```

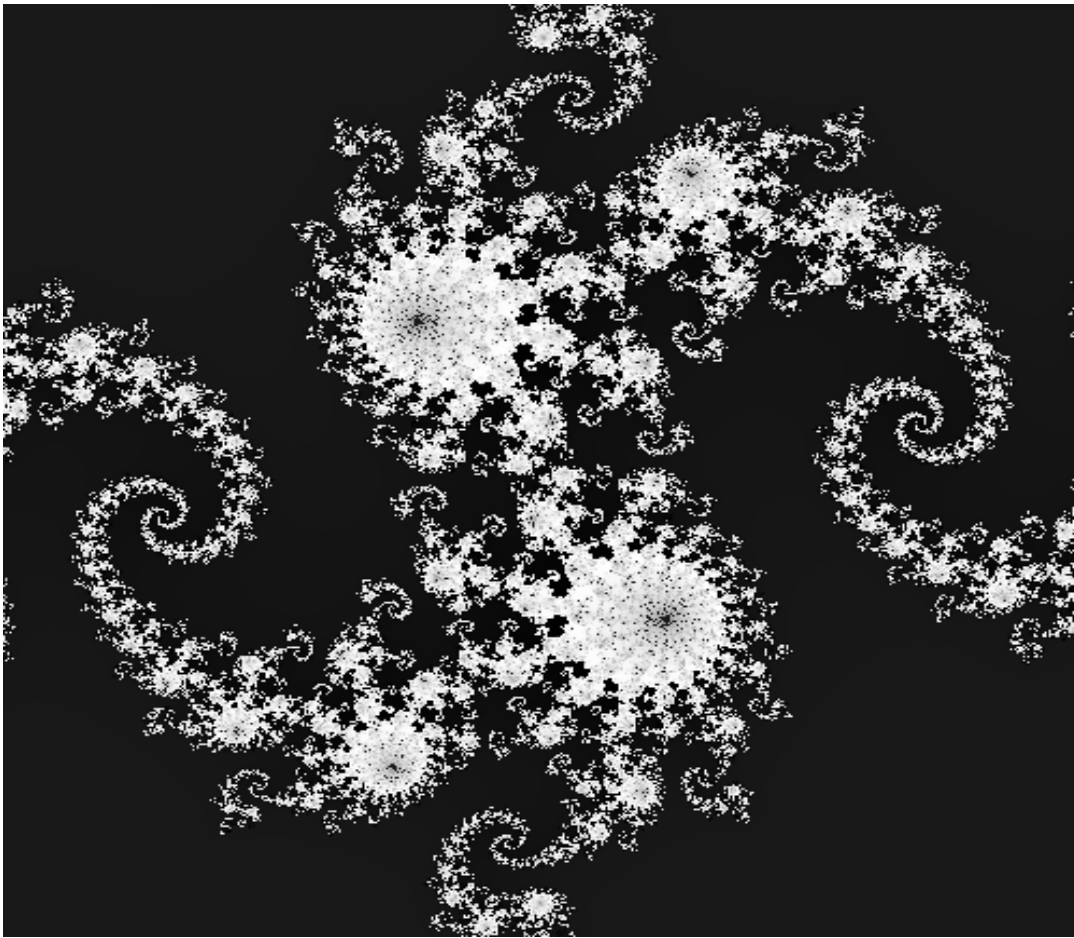
col := | Zmax ← max(Z)
      | for i ∈ 0..N
      |   for j ∈ 0..N
      |     Ri,j ← 25 - 125 ·  $\left( \frac{Z_{i,j}}{Zmax} \right)$ 
      |     Gi,j ← 225 - 255 ·  $\left( \frac{Z_{i,j}}{Zmax} + 3.5 \right)$ 
      |     Bi,j ← 150 - 25 ·  $\ln \left( 1.1 + \frac{Z_{i,j}}{Zmax} \right)$ 
      |     return  $\begin{pmatrix} R \\ G \\ B \end{pmatrix}$ 
  
```



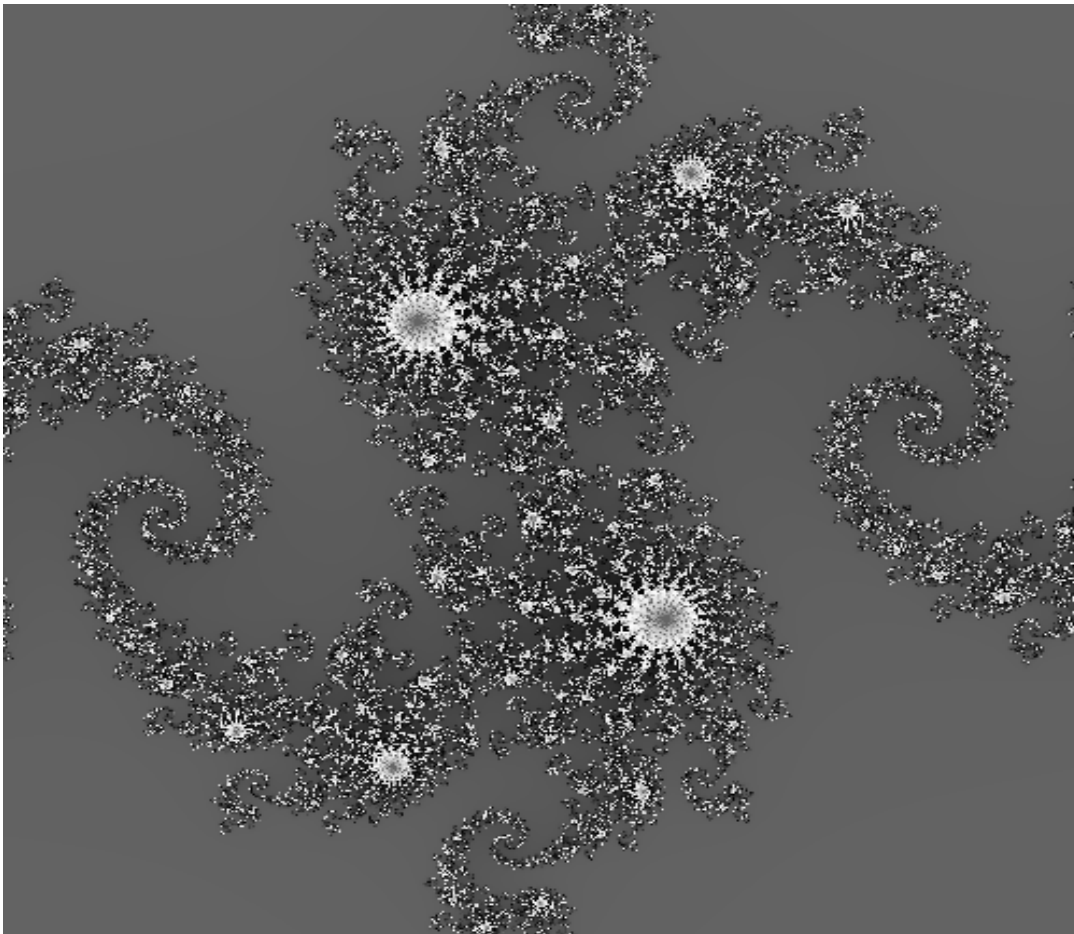
col



col_{2,0}



$\text{col}_{0,0}$



$\text{col}_{1,0}$