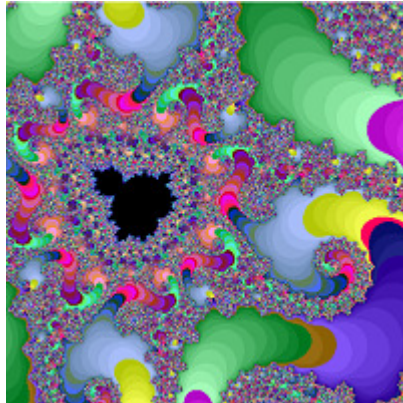
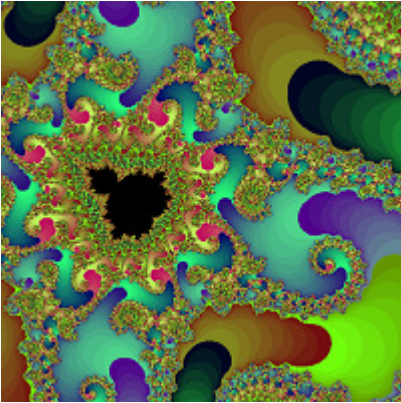


# Generating Colorful Mandebrot Images with Mathcad



## Parameters

Number of pixels in x and y direction  $N := 500$

Bounds of the complex plane to iterate over  $\text{realLower} := -0.74543162$   $\text{realUpper} := -0.74542138$   
 $\text{imagLower} := 0.11300388$   $\text{imagUpper} := 0.11301412$

Maximum iterations for each point  $\text{maxIter} := 1000$

Bailout value  $\text{bailout} := 2$

## Calculations

Generate matrix of complex numbers

$i := 0..N$        $j := 0..N$

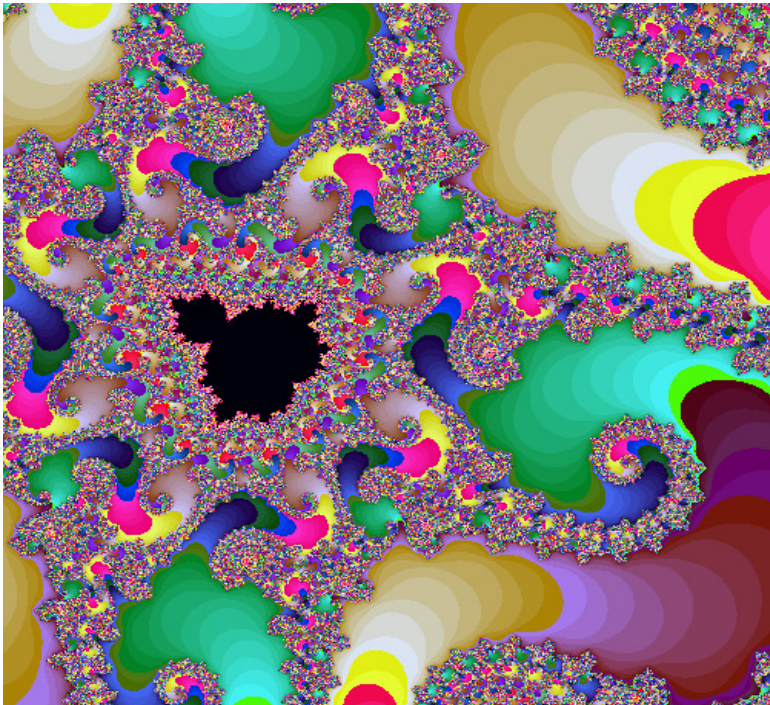
$$\text{imag}_{i,j} := \text{realLower} + \frac{(\text{realUpper} - \text{realLower})}{N} \cdot j + \left[ \text{imagLower} + \frac{(\text{imagUpper} - \text{imagLower})}{N} \cdot i \right] \cdot i$$

Iterate over the complex plane

```
Z := | for i ∈ 0..N
      |   for j ∈ 0..N
      |     z ← imagi,j
      |     for iter ∈ 1..maxIter
      |       | z ← z2 + imagi,j
      |       | 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 := | for i ∈ 0..N
        |   for j ∈ 0..N
        |     Ri,j ← 2 mod(500, Zi,j + 0.1)
        |     Gi,j ← 2 mod(900, Zi,j + 1)
        |     Bi,j ← 20 mod(1000, 50 ln(Zi,j + 1.01))
        |     return (R)
        |               (G)
        |               (B)
```



col