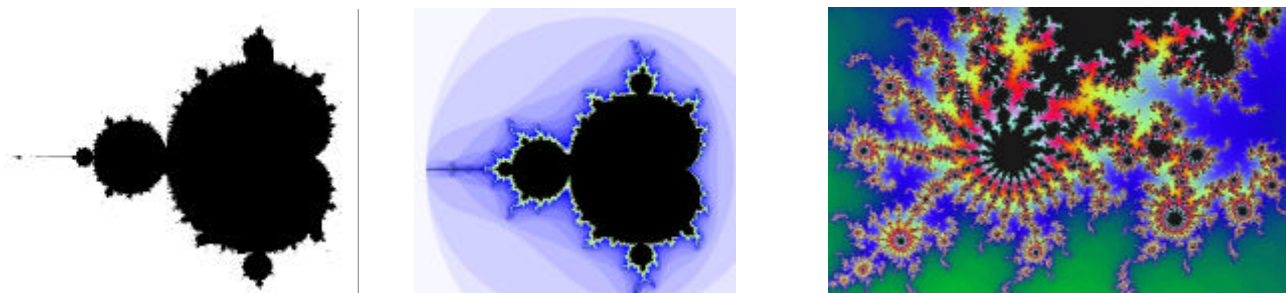


# The Mandelbrot Set



The Mandelbrot set is the set of all points  $C = a + bi$  in the Complex plane such that the modulus (absolute value) of the terms in the quadratic recursion sequence generated by  $C = a + bi$  does NOT diverge to infinity, defined by:

$$z_0 = 0 + 0i, \quad z_1 = C = a + bi, \quad z_{n+1} = (z_n)^2 + C \quad \text{for } n \geq 1$$

---

Let  $C = a + bi$  be a Complex Number.

Define the terms in the quadratic recursion sequence generated by  $C$  as:

$$z_0 = 0 + 0i,$$
$$z_1 = C = a + bi,$$
$$z_{n+1} = (z_n)^2 + C \quad \text{for } n \geq 1$$

Then  $C = a + bi \in$  Mandelbrot Set if and only if  $\lim_{n \rightarrow \infty} |z_n| \neq \infty$ .

---

To generate the spectacular images on the computer, the Mandelbrot program tests:

If  $\lim_{n \rightarrow \infty} |z_n| < 2$ , Then  $C = a + bi \in$  Mandelbrot Set,  
and  $C = a + bi$  is assigned the color of Black.

If  $|z_n| \geq 2$  for any value of  $n$ ,

Then  $\lim_{n \rightarrow \infty} |z_n| = \infty$ , and  $C = a + bi \notin$  Mandelbrot Set,

and  $C = a + bi$  is NOT assigned the color of Black.

The different values of  $C = a + bi$  are assigned colors from a color scheme, depending of the value of  $n$  required to make  $|z_n| \geq 2$ .