An Example of Newton's Method

To calculate the **square root of 5** using Newton's method:

1. We write down a formula that equals zero when we plug in the value $x = \sqrt{5}$. That equation is: $f(x) = x^2 - 5$
2. Next, we form the **derivative** of $f(x)$, which gives us $f'(x) = 2x$ (In general, the derivative of $x^A - B$ for any A and B is just Ax^{A-1})
3. Now we make a new formula from f and f':

$$x_{t+1} = x_t - \frac{f(x_t)}{f'(x_t)}$$ which, in this case, is:

$$x_{t+1} = x_t - \frac{x_t^2 - 5}{2x_t}$$

An Example of Newton's Method

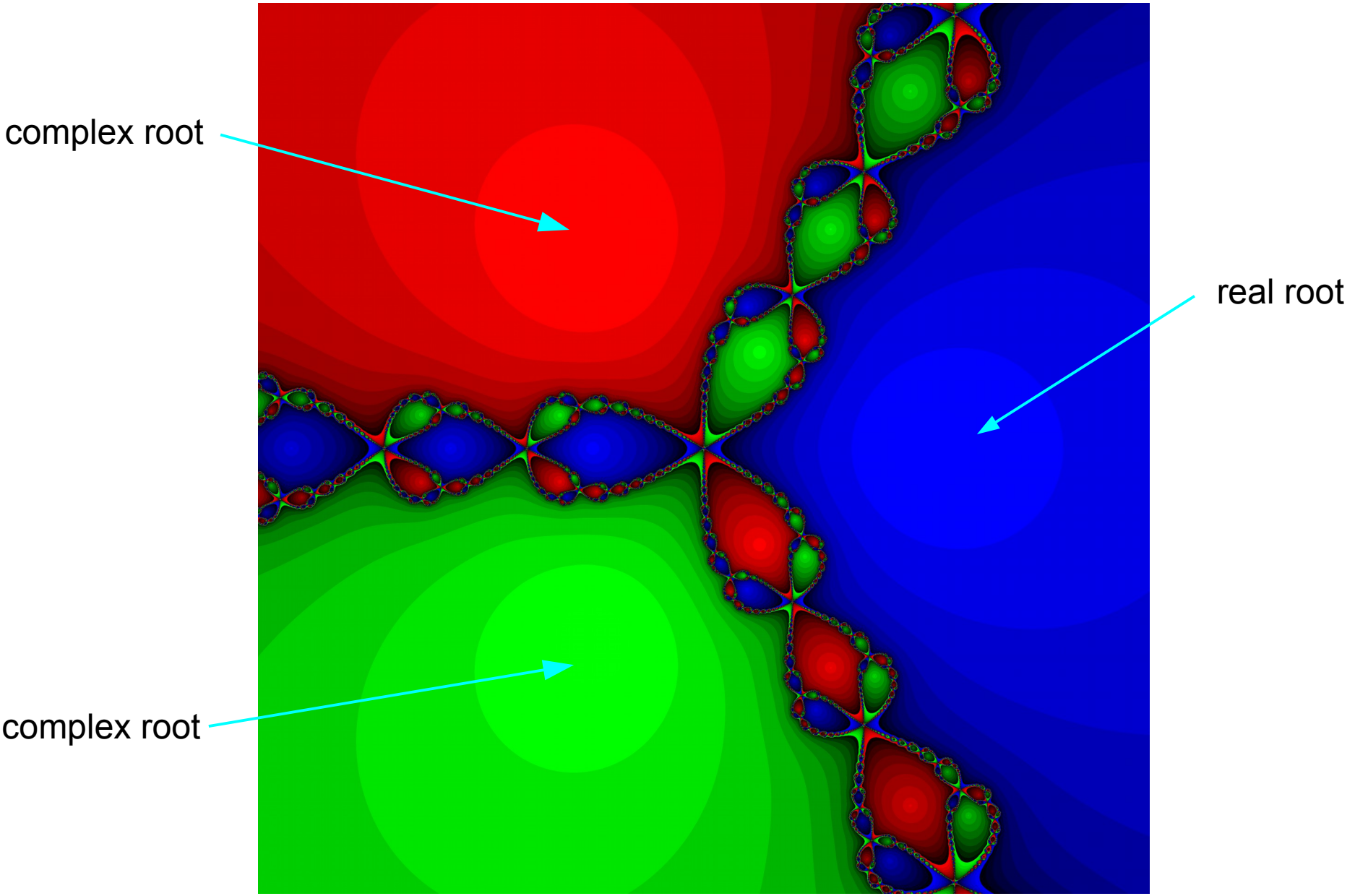
Starting with any random value for x_0 and iterating this equation, we will quickly converge to a very close approximation of $\sqrt{5}$

$$x_{t+1} = x_t - \frac{x_t^2 - 5}{2x_t}$$

Current x value	Current x^2 value
$x = 1.00000$	$x^2 = 1.00000$
$x = 3.00000$	$x^2 = 9.00000$
$x = 2.33333$	$x^2 = 5.44444$
$x = 2.23810$	$x^2 = 5.00907$
$x = 2.23608$	$x^2 = 5.00005$
$x = 2.23607$	$x^2 = 5.00000$

...converged in 5 steps

Newton's Fractal (Cube Roots)



Newton's Fractal (5th Roots)