Julia Sets WE NEED DIAGRAMS

Example 1

Choose a complex number z_0 and look at the sequence:

$z_0 \quad z_1 \quad z_2 \quad z_3$ … where $z_{n+1}=z_n^2$

If we choose:

$z_0=4\,e^{i\pi/5}$

We get:

$4\,e^{i\pi/5} \qquad 16\,e^{i2\pi/5} \qquad 256\,e^{i4\pi/5} \qquad 65536\,e^{i8\pi/5} \quad \dots$

If we choose:

$z_0=\frac{1}{3}e^{i\pi/5}$

We get:

$\frac{1}{3}e^{i\pi/5} \qquad \frac{1}{9}e^{i2\pi/5} \qquad \frac{1}{81}e^{i4\pi/5} \qquad \frac{1}{6561}e^{i8\pi/5} \quad ...$

If $mod(z_0)>1$ then $mod(z_n)$ tends to infinity as n tends to infinity.

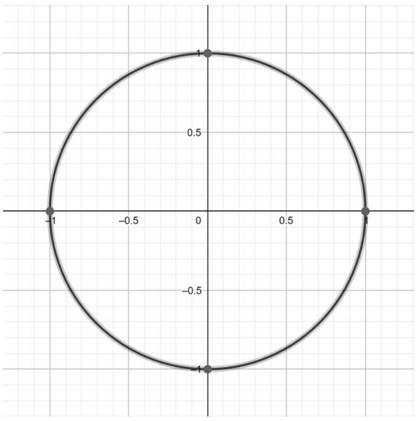
If $mod(z_0)<1$ then $mod(z_n)$ does not tend to infinity as n tends to infinity.

We could colour the number plane.

z_0 is in the red region if $mod(z_0)>1$ and z_0 is in the blue region if $mod(z_0)<1$

The Julia set is the boundary between the red region and the blue region.

A circle.



So far, so boring ...

Example 2

Choose a complex number z_0 and look at the sequence:

$z_0 \quad z_1 \quad z_2 \quad z_3 \ldots$ where $z_{n+1} \to z_n^2 - 0.5 + 0.3i$

For some values of z_0 we find $mod(z_n)$ tends to infinity as n tends to infinity.

For other vales of z_0 we find $mod(z_n)$ does not tend to infinity as n tends to infinity.

We could colour the number plane.

z_0 is in the red region if $mod(z_n)$ tends to infinity as n tends to infinity.

z_0 is in the blue region if $mod(z_n)$ does not tend to infinity as n tends to infinity.

The Julia set is the boundary between the red region and the blue region.

A slightly deformed circle.

WE NEED A DIAGRAM

So far, so slightly interesting ...

In general:

Choose a complex number z_0 and look at the sequence:

$z_0 \quad z_1 \quad z_2 \quad z_3 \ldots$ where $z_{n+1} \to z_n^2 + c$

Look at the Julia set for different values of c The results are truly amazing.

WE NEED DIAGRAMS