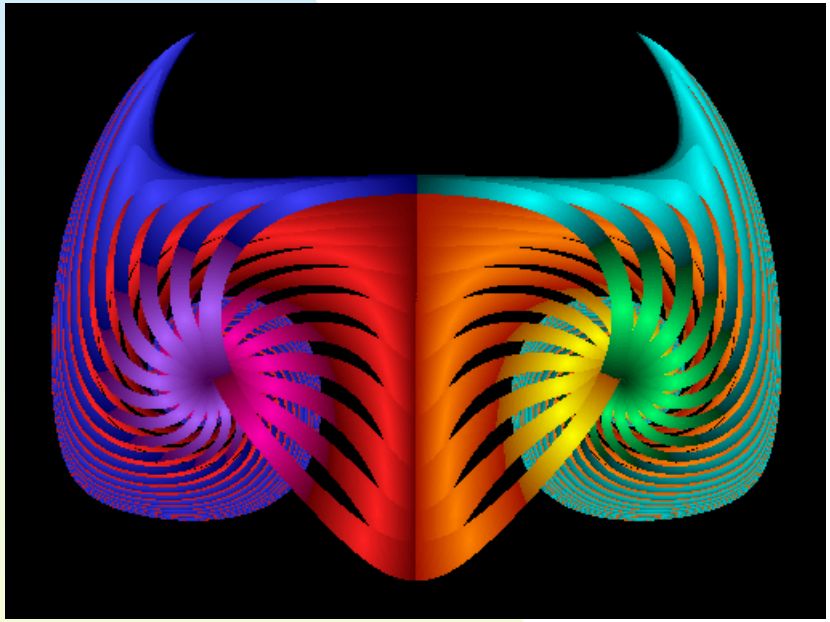
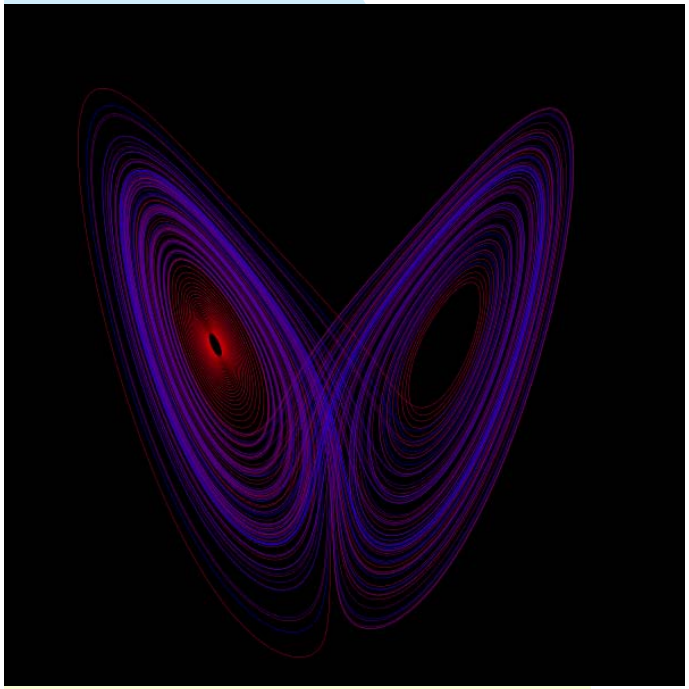
Session overview



- Complex maps and Julia sets
- Reminder: project topics and teams due Thursday before class, earlier is better.
  - Submit survey on Angel

Examples of Lyapunov Exponents

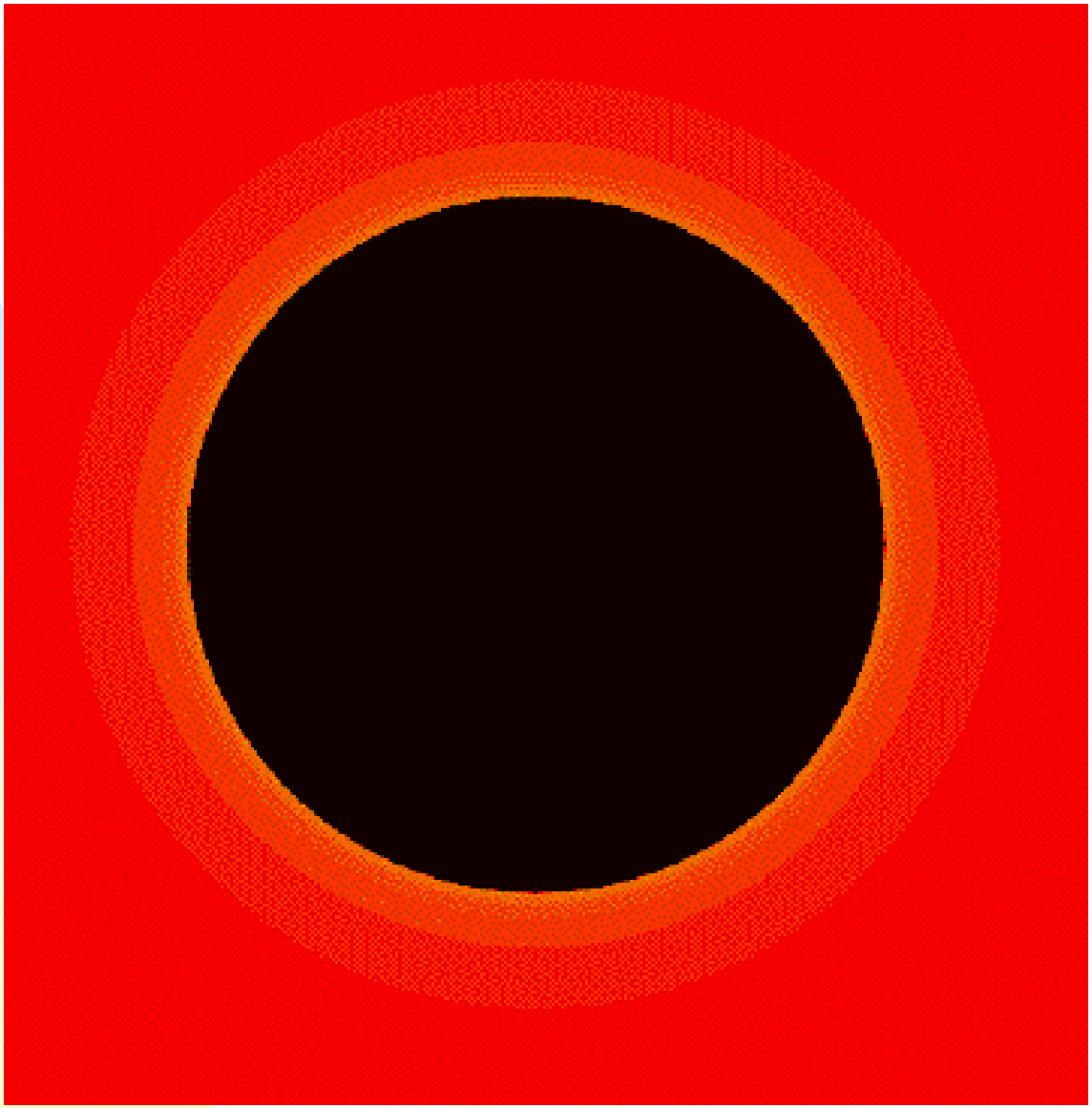


- Henon attractor: $\lambda = 0.419217$
- Lorenz attractor: $\lambda = 0.90563$ (for the parameters given earlier)
- Rossler attractor: $\lambda = 0.13$ (for a=0.15, b=0.2, c-10)

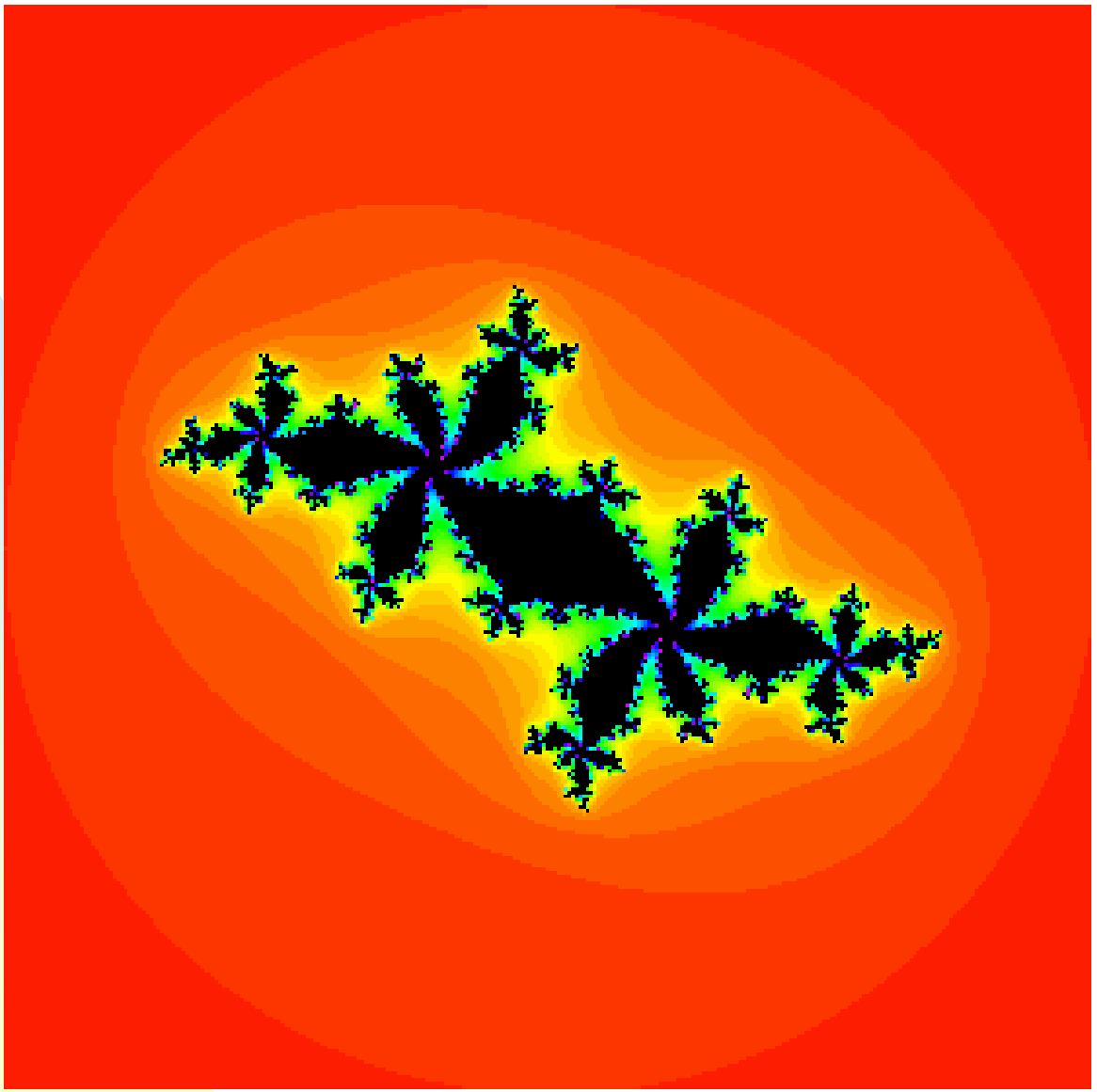
Consider $f(z)=z^2$

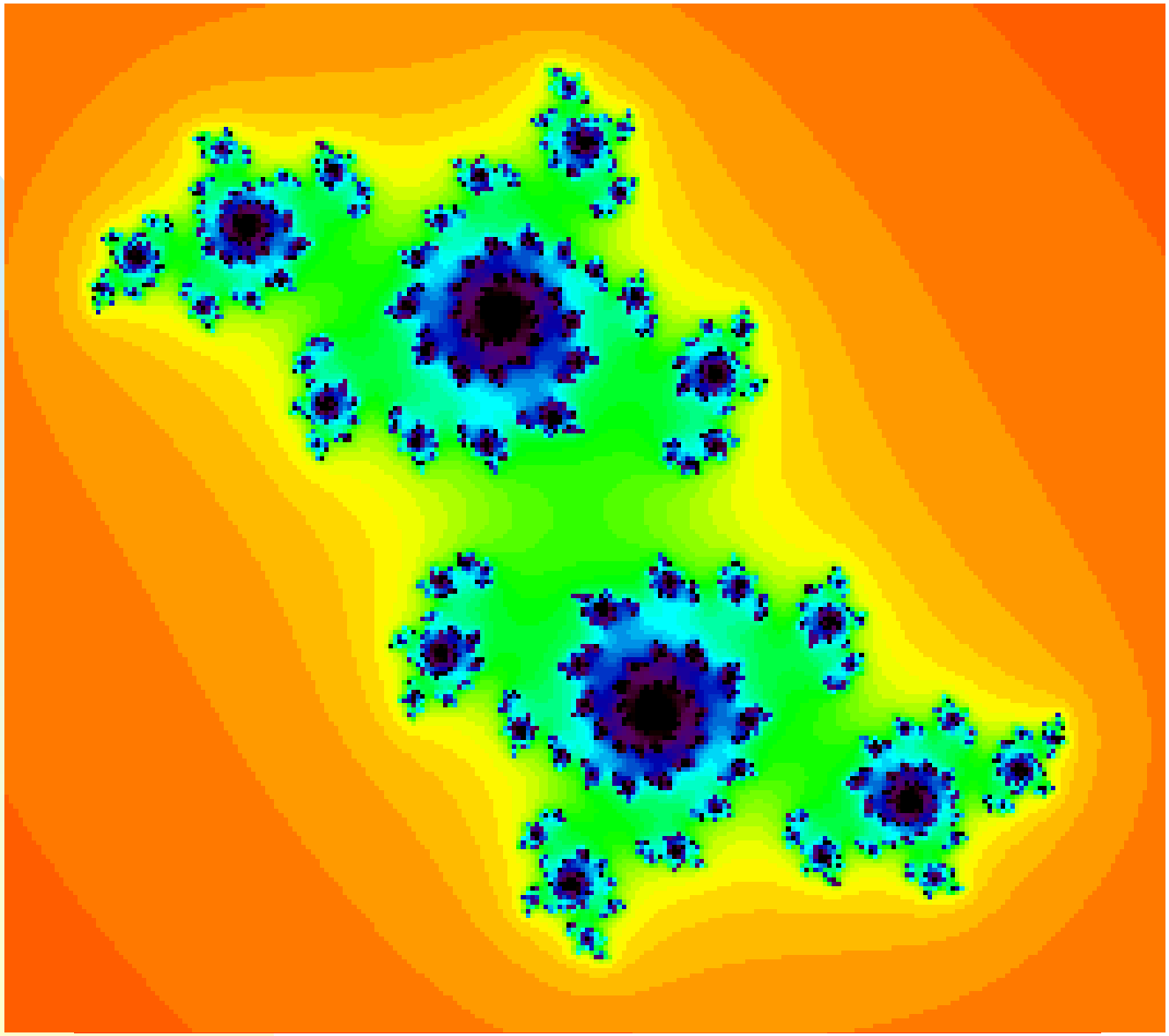
- Plot a number of points together
- Define the escape set and the prisoner set
- Define Julia set
- Define filled Julia set

$c = 0$



$c = -0.52 + 0.57i$





Inverse iteration

- Graphically, one of the easiest ways to find the Julia set is by the *inverse iteration* method
- In this method, we take successive square roots of *z* and plot them
- Use polar form for a complex number to take the square root
  - take the square root of the magnitude
  - take half the angle

Square root properties

- Recognize that successive square roots approach 1 in magnitude
- A typical value for z_0 is 0.5 + 0.5i
- There are two possible square roots at each stage:
  - angle is half the original angle
  - angle is π + half the original angle
- Choose either angle randomly

Example program 1

- The inverse iteration method generates boundaries
- Program `juliasets.cpp` demonstrates this