

Lecture 10: Quiz

Name:

Problem 1

What is the dimension of the Cantor middle set?

- a) $\log(2/3)$ b) $2/3$ c) $\log(2)/\log(3)$ d) $\log(3)/\log(2)$.

Problem 2

What is the answer to "How long is the coast of Britain?" according to Mandelbrot

- a) 19491 miles
b) infinite, it depends on the scale.
c) twice the area divided by π .
d) the dimension times the area.

Problem 3

What is a fractal?

- a) A geometric fractured into several pieces.
b) A set of fractions.
c) A set with cardinality between the integers and reals.
d) A set with non-integer dimension.

Problem 4

Assume we can cover a set X with n boxes of size r . The dimension is the limit:

- a) $\log(r)/\log(n)$ b) $-\log(n)/\log(r)$ c) $\log(n)/\log(r)$ d) $-\log(r)/\log(n)$

Problem 5

We have seen two definitions. One is the Mandelbrot set, one is the Julia set.

Which one is which? Which of the following is the Julia set?

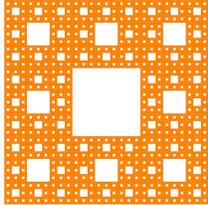
- a) The set of c for which the orbit of $f_c(z) = z^2 + c$ starting with $z = c$ stays bounded.
b) Starting points z for which iterates of $f_c(z) = z^2 + c$ stays bounded.

Problem 6

Who was the first to define the middle third Cantor set?

- a) Mandelbrot
- b) Smith
- c) Cantor
- d) Weierstrass

Problem 7



Which fractal is displayed in the picture?

- a) The sphere of Pythagoras
- b) The Barnsley couliflower
- c) The Mandelbulb
- d) Sierpinski carpet

Problem 8

What is the Mandelbrot set?

- a) The set of c for which the orbit of $T(z) = z^2 + c$ starting with $z = 0$ diverges.
- b) The set of z for which the orbit of $T(z) = z^2 + c$ diverges.
- c) The set of z for which the orbit of $T(z) = z^2 + c$ stays bounded.
- d) The set of c for which the orbit of $T(z) = z^2 + c$ starting with $z = 0$ stays bounded.

Problem 9

Three of the following sets are fractals. Which ones?

- a) The Menger sponge.
- b) The sphere
- c) The graph of $y = x^2 + 1$.
- d) The Koch curve.
- e) The Cantor middle third set.

Problem 10

Remember that $ii = -1$. If we multiply the complex numbers $3 + i$ with $1 + 3i$, we get

- a) $3 + 11i$
- b) $6 + 3i$
- c) $5 + 4i$
- d) $10i$.