

## Lecture 10: Quiz

Name:

### Problem 1

What is a fractal?

- A infinite dimensional set.
- A complicated set in space.
- The Mandelbrot set.
- A set with non-integer dimension.

### Problem 2

What is the formula for the dimension of a set  $X$ ? Assume we can cover a set  $X$  with  $n$  boxes of size  $r$ . We take the limit of

- $-\log(n)/\log(r)$
- $\log(n)/\log(r)$
- $\log(r)/\log(n)$
- $-\log(r)/\log(n)$

### Problem 3

How are Julia sets defined?

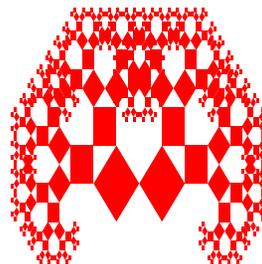
- Points  $z$  for which the orbit of  $f_c(z) = z^2 + c$  stays bounded.
- The boundary of the set of points for which the orbit  $f_c(z) = z^2 + c$  stays bounded.
- The set of  $c$  for which the orbit of  $f_c(z) = z^2 + c$  starting with 0 stays bounded.
- The set of  $c$  for which the orbit of  $f_c(z) = z^2 + c$  starting with  $z = c$  stays bounded.

### Problem 4

Which mathematician has first described a fractal?

- Smith
- Cantor
- Weierstrass
- Mandelbrot

### Problem 5



Which fractal is displayed in the picture?

- The Barnsley fern
- The tree of pythagoras
- The Douady rabbit
- Sierpinsky carpet

### Problem 6

What is the Mandelbrot set

- The set of  $z$  for which the orbit of  $T(z) = z^2 + c$  diverges.
- The set of  $c$  for which the orbit of  $T(z) = z^2 + c$  starting with  $z = 0$  diverges.
- The set of  $z$  for which the orbit of  $T(z) = z^2 + c$  converges.
- The set of  $c$  for which the orbit of  $T(z) = z^2 + c$  starting with  $z = 0$  converges.

### Problem 7

Which of the following sets are fractals?

- The Menger sponge.
- The circle.
- The line.
- The Koch snowflake.

### Problem 8

If we multiply the complex numbers  $1 + 3i$  with  $3 + 4i$ , we get

- $3 + 8i$
- $11 + 10i$ .
- $-5 + 10i$ .
- $-9 + 13i$ .