DEPARTMENT OF MATHEMATICS

MATHS 190 **Lecture 16 Summary**

In this lecture we illustrated an important observations:

- Objects don't have to have integer dimension.

Lecture 16 was based around the following question

Question: What is the dimension of a cloud?

We then discussed what it means for something to be 1-dimensional, or 2-dimensional. If N copies of an object are needed to make a bigger version, bigger by the (linear) scaling factor S, then the dimension of that object is defined to be the number d, where $S^d = N$. This works for lines, squares and cubes.

We used this definition to show that the Koch curve has dimension $1.26185\ldots$ (we need to take 4 copies to get a version that is 3 times bigger).

We discussed how the Koch curve isn't really just a curve (because it's infinitely fuzzy and therefore takes up space), but isn't really a space-filling object either (because it's constructed from lines). So, because it's kind of a fuzzy, partially space-filling curve, it has a dimension somewhere between 1 and 2.

We also computed the dimension of the Sierpinski carpet, the Menger sponge, and the approximate dimension of my piece of broccoli.

Finally you designed fractals of your own and computer their dimension.

Before you come to the next lecture: You should spend an hour or two thinking and reading about the ideas presented in the lecture. You should also:

- Read 6.2

Other activities you could do if you have time are:

- Can you construct a curve with dimension exactly 1.5?