DEPARTMENT OF MATHEMATICS

MATHS 190 **Lecture 16 Summary**

In this lecture we looked at the dimension of geometrical objects.

We investigated the notion of dimension by looking more closely at familiar one-, two- and three-dimensional objects. We found that if N copies of an object are needed to make a bigger version, bigger by the (linear) scaling factor S, and if the dimension of that object is defined to be the number d, then $S^d = N$. This works for lines, squares and cubes.

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 seems to have a dimension somewhere between 1 and 2.

We extended the idea of dimension to define the dimension of fractal objects. We showed that the Koch curve has dimension $1.26185\ldots$ (we need to take 4 copies to get a version that is 3 times bigger, and $3^{1.26185\ldots} = 4$). We also computed the dimension of the Sierpinski carpet and the Menger sponge.

Finally we saw how to design fractals of a given fractal 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:

- Can you construct a curve with dimension exactly 1.5?