DEPARTMENT OF MATHEMATICS

MATHS 190 Lecture 9 Summary

In this lecture we showed that there are infinite sets bigger than the set $\{1, 2, 3, \dots\}$.

We started with the idea that if an infinite set is of the same size as $\{1, 2, 3, \dots\}$, then the members of the set can be written in an ordered list. This gives a one-to-one correspondence between members of the set and the elements of $\{1, 2, 3, \dots\}$.

To show that a set (call it S) is larger than the set $\{1, 2, 3, \dots\}$, we show that any possible list of members of S is missing at least one member of S. We used this method to find two sets that have greater cardinality than the set $\{1, 2, 3, \dots\}$. These big sets were:

- the set of infinite sequences of Os and Xs
- the set of (real) numbers in the interval [0,1].

Ideas about different sizes of infinity were developed by a mathematician called Georg Cantor in around 1874. Many mathematicians did not believe these ideas for many years after Cantor described them, and Cantor was ridiculed and belittled for his ideas. You should expect to find these ideas challenging too!

Before you come to the next lecture: You should spend an hour or two reviewing the material from todays lecture. You should also

- Read §3.3 in the textbook.
- Try some of the Mindscapes at the end of §3.3 in the textbook.

Other activities you could do if you have time are:

- Try to explain why mathematicians believe there are different sizes of infinity to a friend who is not in Maths 190.
- Find out more about Georg Cantor by looking on the internet.