

MA211 : Calculus, Part 1

Lecture 1: Introduction to MA211

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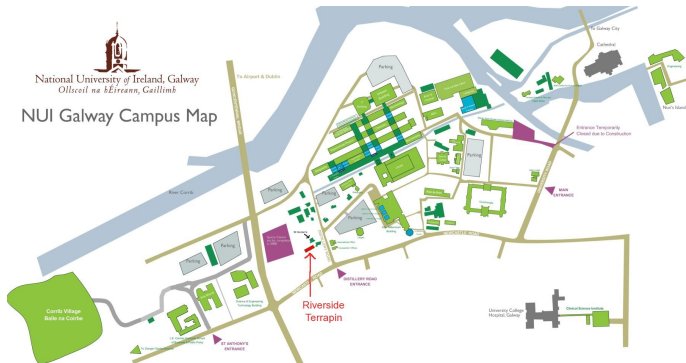
Welcome to MA211

This is Semester 1 of the Second Year Calculus course.

The basic information for the course is as follows:

Lecturer: Dr Niall Madden, Dep of Mathematics. My office is in Room 103, Riverside Terrapin, Distillery Road.

Email: Niall.Madden@NUIGalway.ie, Phone (091 49) 3803.



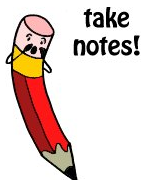
Welcome to MA211

Lectures: Monday and Wednesday at 11 in the Cairnes Lecture Theatre.

Tutorials: To be arranged. They will start during Week 3, and will deal with problem solving.

Web site: The on-line resources for this course are on <http://BlackBoard.NUIGalway.ie>. There you'll find various pieces of information, including these notes.

It may take a week or two for everyone to have access to BlackBoard. In the short term, we'll also use <http://www.maths.NUIGalway.ie/MA211>.



A **summary of each lecture** will be posted to the site no later than 9.30 on the day of the lecture.

Print these out and bring them with you to lectures.

You will then annotate these notes during the class.

The key topics in **MA211** are (but not in order)

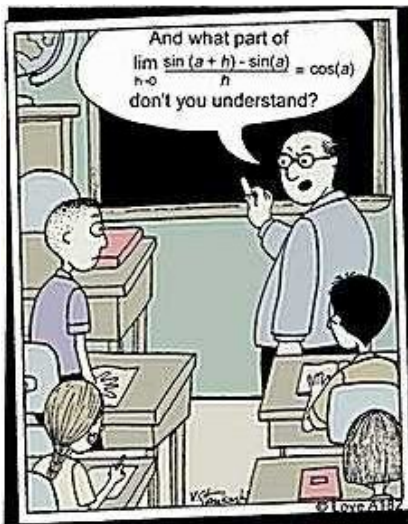
- 1 Sets and functions.
- 2 Methods of integration: substitution, integration by parts, partial fractions, reduction formulae.
- 3 Improper integrals (as limits of finite integrals).
- 4 Differential equations: linear equations with constant coefficients, first order homogeneous equations, boundary value problems, etc.

Mathematical Preliminaries

Anyone who can remember their first year calculus should be able for this course.

Where we make particular use of topics from 1st year, I will try to remind you and give you a reference for a text-book.

If I don't, **please ask!**



There is no required textbook for this course, but two are particularly recommended:

- 1 Stewart: *Calculus* and *Calculus: early transcendentals*. Both are in the library. If buying a copy, get *Calculus*, rather than “early transcendentals”.
- 2 Robert Adams, *Calculus: a short course, 3rd ED*, 515 ADA
There are 7 copies in the library.

If you buy a copy of either of these, you will find it useful for MA211.

Also useful are:

- 1 Anton, *Calculus*, 515 ANT
- 2 Spiegel, *Advanced Calculus*, 515 SPI (12 copies in the library)
 - This is only for the 1st half of the course.

In general: any book with *Calculus* in the title and that covers

- Integration, including Improper Integrals
- Transcendental functions, in particular exponential, logarithmic and hyperbolic functions.
- Differential equations.

Course assessment

Your progress in and commitment to this course will be assessed as follows:

- **Homework Assignment:** There will be exercises included in every lecture. These will be collected into a series of problem sets which will be posted separately to Blackboard. Every 3 weeks (approximately) you will be required to submit *carefully written solutions* to selected exercises. These will be graded and returned to you. The mark you get will count towards your final MA211 grade
- **Class Test:** There will be a 30 minute class test during Week 6.
- **End of Semester Exam:** Worth **75%** of the total grade for MA211.

What is Calculus?

Wikipedia: *Calculus (from Latin, "pebble" or "little stone") is a branch of mathematics that includes the study of limits, derivatives, integrals, and infinite series, and constitutes a major part of modern university education.*

Calculus has widespread applications in science and engineering and is used to solve complex and expansive problems for which algebra alone is insufficient.

It builds on analytic geometry and mathematical analysis and includes two major branches, differential calculus and integral calculus, that are related by the fundamental theorem of calculus.

Exercises

- 1 Goto to the library. Find where they keep the calculus books. Choose any three. Find the section where they introduce the concept of a **limit** of a function at a point. Write down the *definition of a limit* they provide, *their explanation of what it means*, and *One example*.

Rank the books in order of how useful you think they are.

- 2 The study of what we call “Calculus” is said to have been started by *Isaac Newton* and *Gottfried von Leibniz*. Find out when and where they lived, and what their major mathematical discoveries were.