

MA211 : Calculus, Part 1

# Lecture 1: Introduction to MA211

Dr Niall Madden

08 September 2008



# Outline

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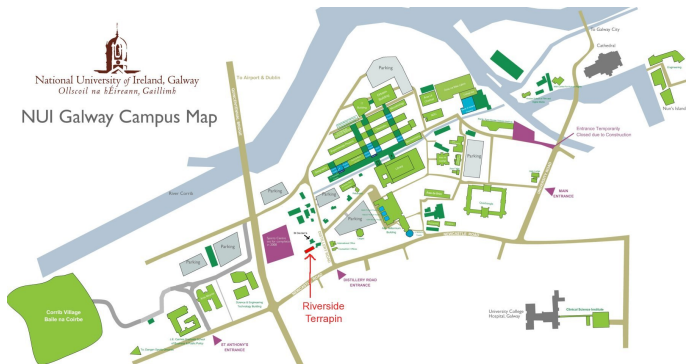
# Welcome to MA211

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



# Welcome to MA211

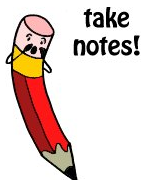
**Lectures:** Monday and Wednesday at 11 in the Cairnes Lecture Theatre.

**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>.

# Lecture Notes



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)

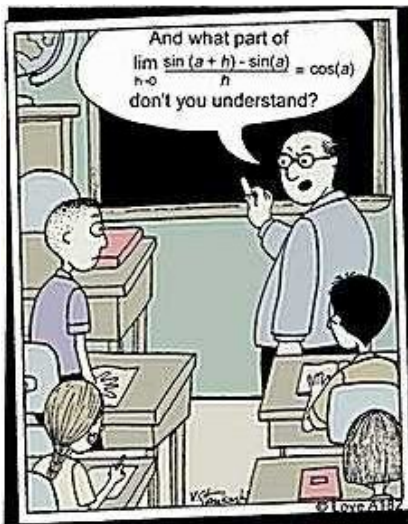
- 1 Sets and functions.
- 2 Methods of integration: substitution, integration by parts, partial fractions, reduction formulae.
- 3 Improper integrals (as limits of finite integrals).
- 4 Differential equations: linear equations with constant coefficients, first order homogeneous equations, boundary value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