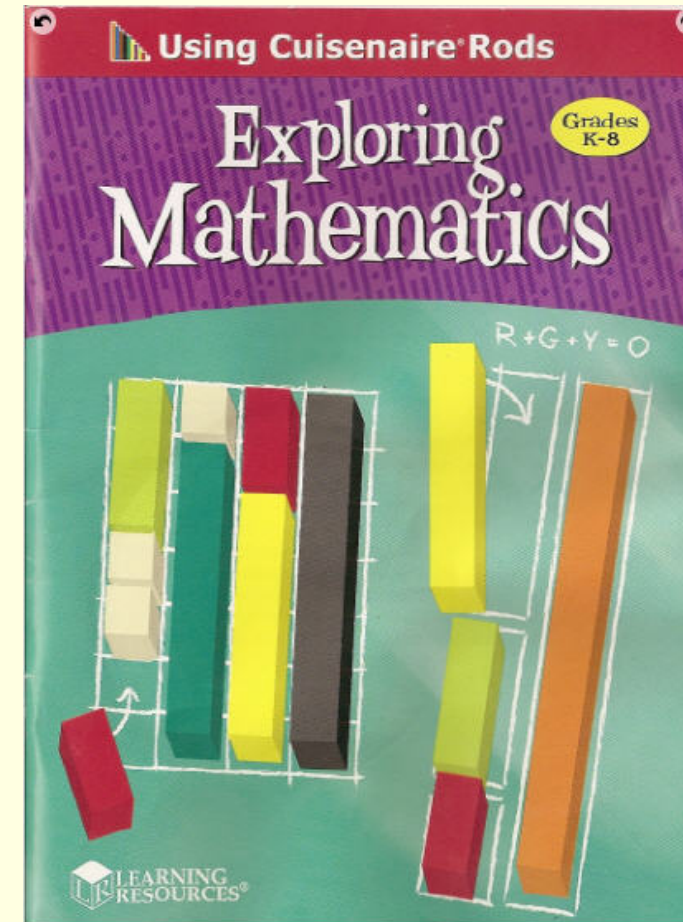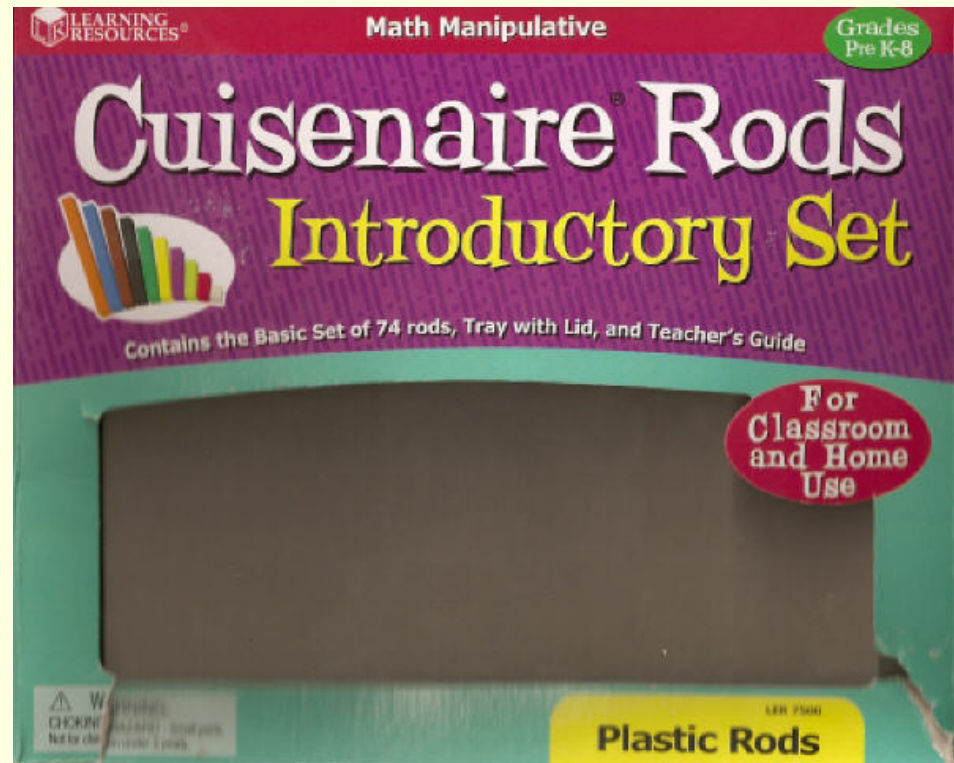# Mathematics for Foundation Year students

2021-22

Dr CDC Steele, Director of Service Teaching, Department of Mathematics

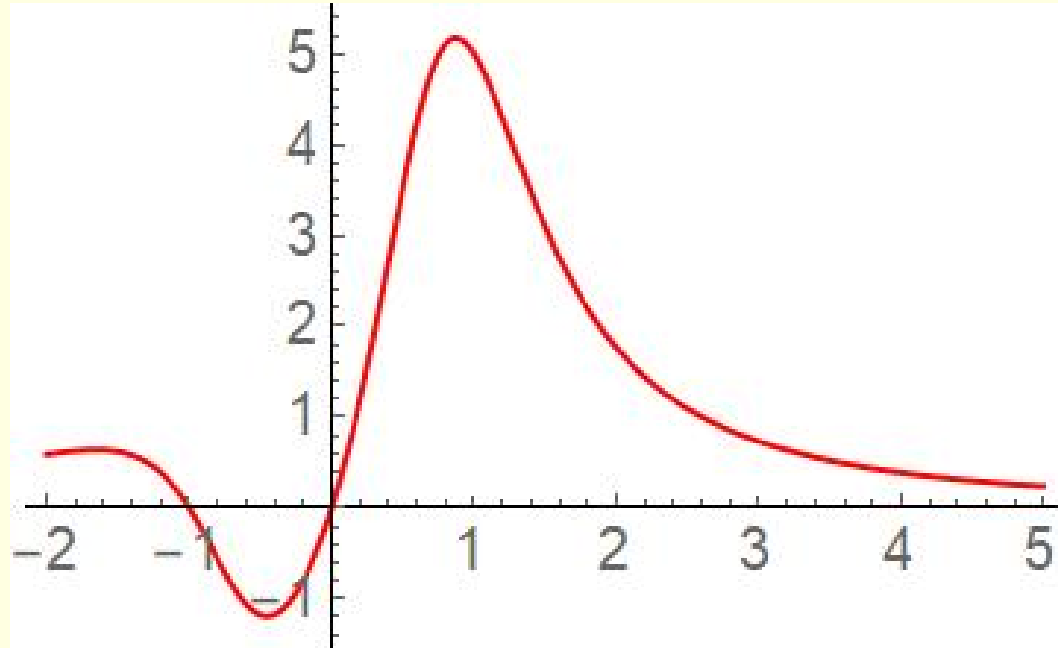Alan Turing Building/2.212, 0161 30 63632, colin.steele@manchester.ac.uk

Pieces of Mathematics

Algebra

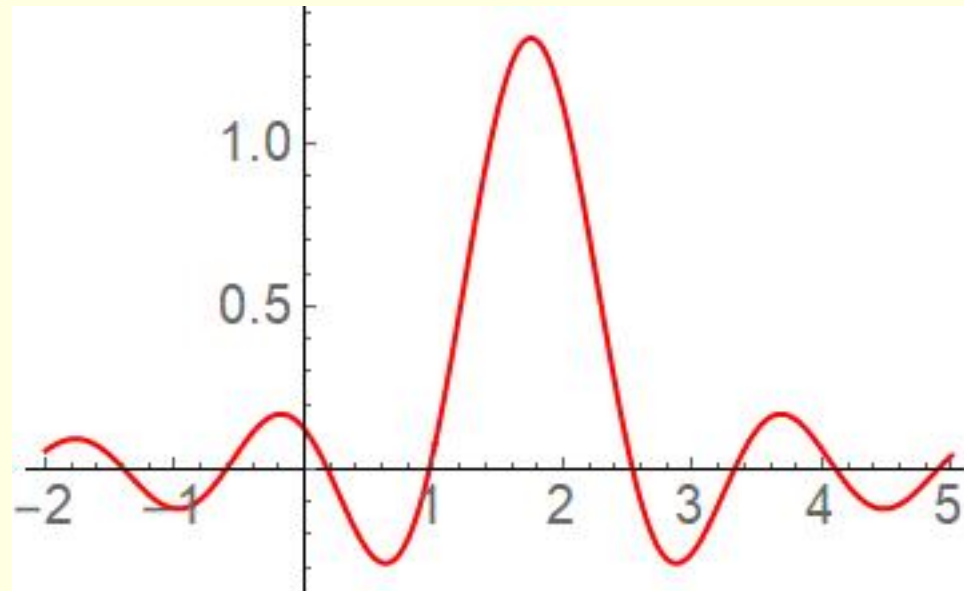$$\frac{x-2}{x+5} = \frac{x}{x^2-3}$$

- Equations

- Graphs

- Functions
  - trigonometric
  - logarithmic
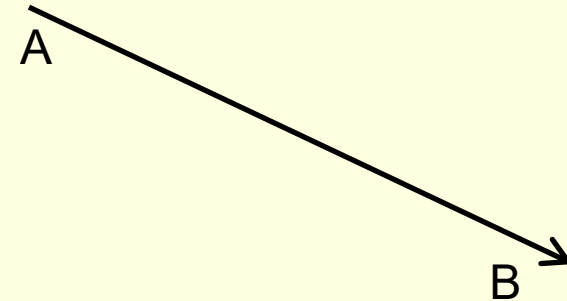 - exponential
  - other

Calculus

- Where is function greatest ?
- Where is function least ?

- What is area under graph ?

- Differential Equations

Geometry and Vectors

- Geometry and Coordinates
- Trigonometry
- Polar Coordinates

- Vectors
- Lines and Planes
- Areas, Volumes,
- lengths, angles
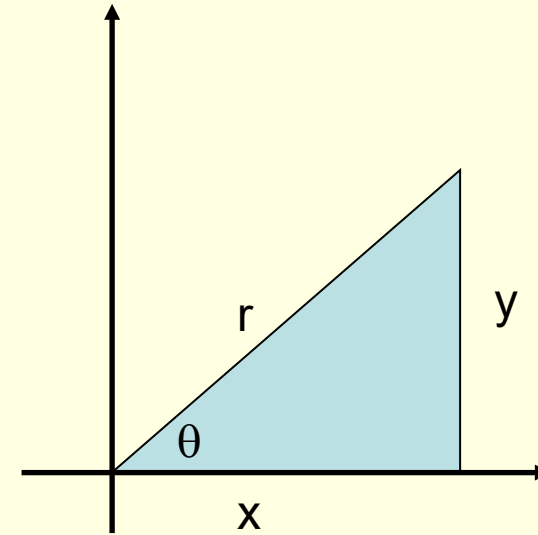
Logic and Proof

- Sets
- Venn Diagrams
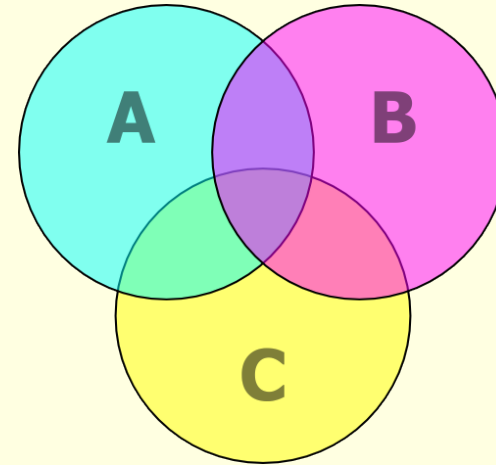
- Logic : When p is true then q is true.
- If p is false what can be said about q ?

- Proof $1+3+5+7+9+11+...+(2n-1)=n^2$

Mechanics
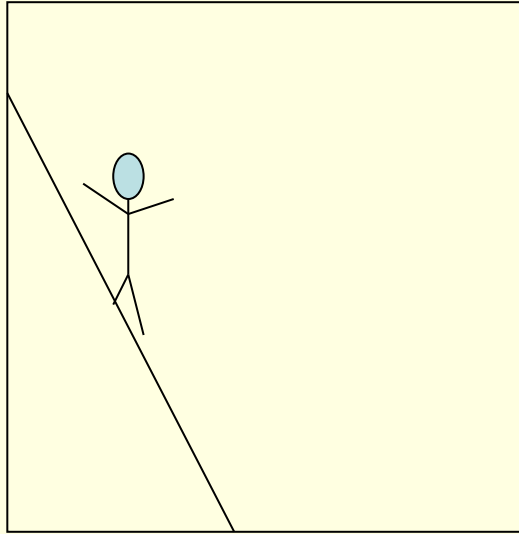
Will the ladder slip ?   **How far will the ball go ?**
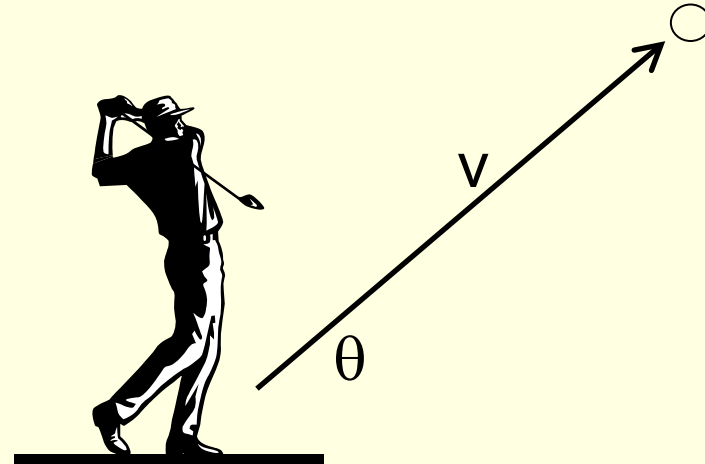
Numerical Methods

- Finding values of functions
- if f(2) = 5 and f(5) = 14, what is f(4) ?
- Difficult integrals

$$\int_0^\pi \sin\left(x^2\right) dx$$

- Solving difficult equations

$$2^x = 5 - \sin x$$

Complex Numbers

- What is the square root of -1 ?
- Call it i

- $a + i b$ is a complex number

Probability

- Toss 5 coins. What is the probability of 4 heads and a tail ?
- If there is a 5% probability of missing a bus, what is the probability of catching it every day for a week ?
- What is the probability of an IQ greater than 130 ?

Maths Courses

- Semester 1

- 0B1 or 0C1
- Calculus /Algebra

- 0N1 : Pure Maths / Logic

- Students take both course units

- Semester 2

- 0B2 or 0C2 Calculus / Algebra

- 0F2 : Vectors / Probability

- 0J2 : Mechanics

- 0D2 : Computational Maths

- Students take some or all of these course units

- Course Units 0B1 and 0B2
- Designed for students arriving with significant mathematical achievements past age-16 level

- Course Units 0C1 and 0C2
- Designed for students arriving with less significant mathematical achievements past age-16 level

Will I take 0B1/2 or 0C1/2 ??

- Diagnostic Exercise on Tuesday

- Does NOT produce mark for assessment
- Gives us an idea of strong and weak areas
- Used to assemble tutorial groups
- Allocate students to 0B1 or 0C1

Diagnostic Exericse

- Wednesday 22nd September 2021, 12:00 to 12:40
- Go to Blackboard area for MATH19881
- Currently see
  - Video and datasheet about the exercise
  - Sample questions
  - Quiz about qualifications etc.
  - Area where actual exercise will take place.

Diagnostic Exercise

- Blackboard Course Unit Allocation

- Look in your Grade Centre for MATH19881 to see your allocation.

Diagnostic Exercise

- Blackboard Course Unit Allocation

- Lo... ...ur allo...

Diagnostic Exercise

- 24 questions in 40 minutes
- 5 Multiple-choice options plus
- Some other answer (H)
- I have not met this before (A)
- I have met this before but forgotten (B)

Diagnostic Exercise

- Still time to practice using the pre-registration site.

-

- Not something to worry about

Typical Maths Unit

- Several videos per week (followed by questions etc.)

- Review Session Each week

- 1 tutorial per week

- Exam at end of semester i.e. January 2022

- 'Coursework' assignments during semester

Further Details of each course unit

- In the section for "welcome fortnight" or similar, for each unit, find a resources describing that unit.

Videos

- New material introduced by lecturer
- Available on the relevant Blackboard area
- Students expected to pay attention and take notes
- Questions will be available to practice these topics.

Review Sessions

- Led by the lecturer
- Summary, further examples, polls and quizzes, question and answer etc.

- Whatever else the students benefit from

Tutorials

- One tutor and 30-40 students

- Consolidation of existing material
- Normally revolves around example sheets given out in advance or at class. Can have further questions during class.
- Students attempt questions before class starts (e.g. at home, in library etc)
- Tutor will discuss questions with students leading to increased understanding.
- Any aspect of course unit can be discussed as well.

Coursework

- Contributes to mark for course unit (e.g. 30%)
- Leads to increased understanding

- Carry out work and upload scan
- Enter answers directly into computer.

Work Patterns

- Before watching a video
  - Make sure you understand material from previous lessons
- After watching a video
  - Make sure that you have notes of a form that you feel happy with
  - Go over the notes and make sure you understand
  - Attempt some examples sheet questions
  - Personalise the notes
  - If you don't understand - ASK

Work Patterns

- Before a tutorial / examples class
  - Make sure that you have attempted all relevant questions
  - Decide which questions form a priority for you in the class
  - Decide what you want to ask the tutor
  - Make sure you bring all relevant materials

Work Patterns

- After a tutorial
  - Review what went on at the tutorial
  - Make sure that you now understand any topics that you were unsure about
  - Decide if you need to ask further about anything.

Work Patterns

- Before Coursework / Test
  - Make sure you start your preparation early enough.
  - Make sure that you understand the relevant material
  - Make sure you understand the arrangement and have read document on coursework tests
- After Coursework / Test
  - Make sure that you understand where you may have gone wrong.

Other study techniques

- Summarise your notes.
- Read around the topic.
- Explain topics to your friends.
- Make up your own examples and try them on your friends.

Work Patterns

- ## General
  - – Make sure you understand at all stages

HELM Files

- .pdf files giving further notes on maths topics.
- Various modules in 1-20
- Can only be viewed by members of the university
- https://www.mub.eps.manchester.ac.uk/helm/

Formula Tables

- 34 page document containing useful formulae

- Can be downloaded from web-page
- https://personalpages.manchester.ac.uk/staff/colin.steele/formtabsV2.pdf

Office hours

- Lecturers maintain office hours – opportunity for students to ask questions.

- Any maths problems or issues – take part in office hours.

Why is mathematics like pottery ?

Why is mathematics like pottery ?

You can't do it without getting your hands dirty

Why is mathematics like pottery ?

You can't do it without getting your hands dirty

You cannot learn to understand mathematics just by watching other people do it. You must practice it yourself.

Before an examination, you revise ?

Why is it called 'revise' ?

Before an examination, you revise ?

Why is it called 'revise' ?

Dictionary.com Unabridged (v 1.0.1) – Cite This Source *new!*

re·vise [ri-**vahyz**] Pronunciation Key – Show IPA Pronunciation *verb,* –**vised,** –**vis·ing,** *noun*

–*verb (used with object)*
1. to amend or alter: *to revise one's opinion.*
2. to alter something already written or printed, in order to make corrections, improve, or update: *to revise a manuscript.*
3. *British.* to review (previously studied materials) in preparation for an examination.

–*noun*
4. an act of revising.
5. a revised form of something; revision.
6. *Printing.* a proof sheet taken after alterations have been made, for further examination or correction.

Definition from dictionary.com

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Definition from dictionary.com

previously studied materials

Where do we use maths ?

Where do we use maths ?

- Science

- Chemistry, Computer Science, Earth Science, Materials Science, Physics

- Engineering

- Aerospace, Chemical, Civil, Electrical, Mechanical

Where do we use maths ?

- Science ▮

  – Chemistry, Computer Science, Earth Science, Materials Science, Physics

- Engineering ▯

  – Aerospace, Chemical, Civil, Electrical, Mechanical, Petroleum

- But what would happen without maths ?

And finally

And finally

- Study maths.

And finally

- Study maths.
- Study your other subjects

And finally

- Study maths.
- Study your other subjects

- Take part in other activities

And finally

- Study maths.
- Study your other subjects

- Take part in other activities

- Get the balance right
- Get a routine

Questions

- ????

Mathematics for Foundation Year students