

# Fundamentals of Algebra and Calculus

- All on STACK (supported on Moodle), no in-person content
- Preparation for Calculus with Applications and Proof and Problem Solving
- Algebra
  1. Vectors
  2. Polynomials and rational functions
  3. Functions (including trigonometric, exponential and logarithmic)
  4. Complex numbers
  5. Sequences and series
- Calculus
  1. Principles and techniques of differentiation
  2. Further techniques and applications of differentiation
  3. Principles of integration
  4. Methods of integration
  5. Applications of integration

# FAC availability

- Students do diagnostic test on arrival
- But, available over the summer and can be completed then
- Problem! Need a UoE log-in
- Have asked for a copy on the STACK demo server where I put Maths for Computing for the Summer School

# Mathematics for Computing

- Voluntary content on STACK offered during Inf1A and in Informatics Summer School
- No quizzes at present, just videos and reference to online book Discrete Mathematics by Oscar Levin

## Existing

### 1. Introduction to Set Theory

### 2. Introduction to Relations and Functions

### 3. Logic: Predicates and quantifiers

- 3.1. Predicates and Quantifiers

### 4. Proof

- 4.1. Direct Proof
- 4.2. Proof by Contraposition
- 4.3. Proof by Contradiction

### 5. Proof by Induction

- 5.1. Induction and Matrices

### 6. Introduction to Number Theory and Modular Arithmetic

## Needs to be made

- 7. Graph Theory

- 8.1. Trees

- 8. Sequences and Sums

- 9. Number Bases

- 10 Vectors and Matrices \*\*\*

# Covid19 and Maths Content in Scottish Schools

We **will not** assess you on the following topics in the 2022 Higher Mathematics exam:

- ◆ vectors
- ◆ recurrence relations
- ◆ sketching the graph of  $y = f'(x)$  given the graph of  $y = f(x)$
- ◆ finding the coordinates of the point(s) of the intersection of two curves
- ◆ solving for  $a$  and  $b$  an equation of the form  $y = ax^b$  (or  $y = ab^x$ ) given two pairs of corresponding values of  $x$  and  $y$
- ◆ sketching the graph of the inverse of a logarithmic or an exponential function
- ◆ using differentiation to determine the equation of a tangent to a curve at a given point
- ◆ using differentiation to determine the stationary points of an algebraic function and then sketching the graph of the function with all important features identified on the graph
- ◆ solving any problems containing the phrase 'rate of change'
- ◆ \*integrating a function of the form  $(x + q)^n$
- ◆ integrating any trigonometric function
- ◆ finding the area between two curves
- ◆ proving any trigonometric identity

# Content not examined on Adv Higher

- ◆ investigating points of inflection
- ◆ investigating features of graphs:
  - points of inflection
  - stationary points
  - domain and range
  - odd, even, or neither
  - continuous or discontinuous
  - extrema of functions: the maximum and minimum values of a continuous function  $f$  defined on a closed interval  $[a, b]$  can occur at stationary points, end points, or points where  $f'$  is not defined
- ◆ sketching graphs using features given or obtained
- ◆ sketching related functions:
  - modulus functions
  - inverse functions
  - functions differentiated
  - translations and reflections

Understanding and using matrix algebra

Using indirect or direct proof in straightforward examples

- ◆ using the general term for a binomial expansion, finding a specific term in an expression
- ◆ determining the sum to infinity of geometric series
- ◆ determining the condition for a geometric series to converge
- ◆ knowing and using sums of certain series, and other straightforward results and combinations of these

Finding the inverse of a matrix

Using transformation matrices