

Autumn Term plan

Year 12 Further Mathematics A Level

Complex numbers

- Solve any quadratic equation with real coefficients; solve cubic or quartic equations with real coefficients (given sufficient information to deduce at least one root for cubics or at least one complex root or quadratic factor for quartics).
- Add, subtract, multiply and divide complex numbers in the form $x + iy$ with x and y real; understand and use the terms 'real part' and 'imaginary part'
- Understand and use the complex conjugate; know that non-real roots of polynomial equations with real coefficients occur in conjugate pairs. Knowledge/skill
- Use and interpret Argand diagrams. Content
- Convert between the Cartesian form and the modulus-argument form of a complex number
- Multiply and divide complex numbers in modulus-argument form
- Construct and interpret simple loci in the Argand diagram such as $|z - a| > r$ and $\arg(z - a) = \theta$

Algebra Series

- Understand and use the relationship between roots and coefficients of polynomial equations up to quartic equations.
- Form a polynomial equation whose roots are a linear transformation of the roots of a given polynomial equation (of at least cubic degree).
- Understand and use formulae for the sums of integers, squares and cubes and use these to sum other series.
- Understand and use the method of differences for summation of series.
- Construct proofs using mathematical induction; contexts include sums of series, divisibility, and powers of matrices.

Half Term

Rational functions

- Graphs of rational functions formed from linear functions; asymptotes, points of intersection with coordinate axes or other straight lines; associated inequalities.
- Graphs of rational functions formed from linear functions, including cases when some of these coefficients are zero; asymptotes parallel to coordinate axes; oblique asymptotes.
- Using quadratic theory (not calculus) to find the possible values of the function and coordinates of the stationary points of the graph for rational functions
- Sketching graphs of conic curves including intercepts with axes and equations of asymptotes of hyperbolas

Matrices

- Add, subtract and multiply conformable matrices; multiply a matrix by a scalar.
- Understand and use zero and identity matrices.
- Use matrices to represent linear transformations in 2D; successive transformations; single transformations in 3D (3D transformations confined to reflection in one of $x = 0$, $y = 0$, $z = 0$ or rotation about one of the coordinate axes)
- Find invariant points and lines for a linear transformation.
- Calculate determinants of 2×2 matrices and interpret as scale factors