

The following topics and skills may appear on the University of Bristol Mathematics exam.

- Complex numbers
 - As roots of quadratic equations
 - The modulus, argument, and conjugate of a complex number and their geometric interpretations
 - The representation of complex numbers in Cartesian form $(a+bi)$, Polar form $(r(\cos \theta + i \sin \theta))$, and exponential form $(re^{i\theta})$
 - Arithmetic with complex numbers
 - The geometric interpretation of the addition and subtraction of complex numbers
 - The representation of complex numbers and simple loci on an Argand diagram, particularly loci of the form $|z - a| = k$, $\operatorname{Re}(z) = k$, $\operatorname{Im}(z) = k$, and $|z - a| = |z - b|$
 - Know and use Euler's formula, $e^{i\theta} = \cos \theta + i \sin \theta$
 - Know de Moivre's theorem and use it to prove trigonometric identities and find roots of a complex number
- Vectors
 - Use vectors in two and three dimensions
 - Understand and calculate the magnitude of vectors, and understand the concept of unit vectors
 - Perform vector addition and multiplication by scalars, and understand their geometric interpretation
 - Calculate the scalar/dot product of two vectors, and use it to calculate the angle between vectors
 - Calculate the vector/cross product of two vectors, and use it to calculate perpendicular vectors
 - Calculate the triple scalar product of three vectors, $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$
 - Understand the interpretation of $|\mathbf{a} \times \mathbf{b}|$ as an area and $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$ as a volume
- Matrices
 - Understand the concept of an $m \times n$ matrix
 - Understand the concepts of zero and identity matrices, and of the transpose of a matrix
 - Add, subtract, and multiply matrices
 - Understand that matrix multiplication is associative but not commutative
 - Evaluate the determinants of 2×2 and 3×3 matrices
 - Find the inverse of a 2×2 matrix
 - Solve a system of two linear equations in two unknowns using Cramer's rule
 - Understand 2-dimensional transformations as matrices
- Integrals
 - Evaluate $\int f(x) dx$ when $f(x) = x^n$, including $n = -1$, and related sums, differences, and scalar multiples
 - Perform simple cases of integration by substitution and integration by parts
 - Evaluate definite integrals and use them to find the area under a curve or between two curves
 - Integrate and differentiate trigonometric functions and simple cases of their inverses
 - Integrate and differentiate e^x and related functions

- Differential equations
 - Find general and particular solutions to simple, separable first order ordinary differential equations, including applications to practical problems
 - Use an integrating factor to solve ordinary differential equations of the form $y' + P(x)y = Q(x)$
 - Solve linear second order ordinary differential equations of the form $ay'' + by' + cy = 0$ by using an auxiliary equation
 - Solve linear second order ordinary differential equations of the form $ay'' + by' + cy = f(x)$ by finding the complementary function and a particular integral, where $f(x)$ may be a polynomial, a trigonometric function, or an exponential function
 - Solve the equation for simple harmonic motion $\ddot{x} = -\omega^2x$ and relate the solution to the motion
 - Model damped harmonic motion using second order ordinary differential equations and interpret their solutions