Mathematics

Example 10 hr bespoke programme for a pre-degree student

Module 1: Integration toolkit

- Integration by substitution
- Integration by parts
- Introduction to differential equations: direct integration

Pre-tutorial preparation—independent learning to help you get ahead

1. Familiarise yourself with section 2 onwards of How do undergraduates do mathematics? to understand how to approach learning maths like an Oxford student—including being introduced to rigorous proofs of the mathematical theorems behind the techniques
2. Work through prepared notes and exercises on techniques of integration

Formal submission—your tutor will give written feedback on each submission

Oxbridge-style problem sheet involving various ingenious tricks that can be used in combinations with techniques of integration such as integration by parts and integration by substitution. The tricks involve algebraic manipulation of the integrand, and others make use of trigonometric identities to simplify integrals of powers of trigonometric functions. They include partial fraction decomposition, completing the square, and splitting the numerator.

Module 2: First order differential equations

- Separation of variables
- Reduction to separable form by substitution
- First order linear differential equations

Pre-tutorial preparation

Work through prepared notes and exercises on basic differential equations

Formal submission

Oxbridge-style problem sheet on solving first order differential equations in unfamiliar applications

Module 3: Second order linear differential equations

- Two theorems
- Second order homogeneous linear ODEs
- Introduction to the homogeneous and inhomogeneous cases for linear ODEs with constant coefficients

Pre-tutorial preparation

Work through prepared notes and exercises on more complicated differential equations

Formal submission

Oxbridge-style problem sheet on solving second order differential equations in unfamiliar applications

Example topics only. Exact content will depend on the expertise of the individual tutor and will be tailored to the prior knowledge, ability and interests of the student.