

MATH1001 Differential Calculus

3 credit points

Assumed knowledge: HSC Mathematics Extension 1

Prohibition: May not be counted with MATH1901 or MATH1011 or MATH1906.

Contact Hours: 6 per week (Summer School), or 3 per week (Semester 1).

Assessment: One 1.5 hour examination and assigned work.

This unit begins with a brief introduction to complex numbers, and then builds on the calculus content of HSC Mathematics Extension 1. The notion of a limit, which underpins the calculus, is discussed and the idea of derivative is extended to functions of two variables. Topics covered include the following:

Complex Numbers. Definitions, addition and multiplication. Geometric representation, Argand diagram, modulus and argument, conjugates. Solving quadratics. Polar form, de Moivre's theorem.

Functions. Domain and codomain. Injective, surjective and bijective functions. Composition and inverse. The hyperbolic functions.

Functions of two variables. Curves and surfaces in space. Level curves. Parametric representations. Tangent planes to surfaces. Partial derivatives. Differentials. Chain rule. Continuity and differentiability. Critical points. Directional derivatives and the gradient.

Limits. Limits and continuity. L'Hôpital's rule. The intermediate value theorem. Rolle's theorem. Differentiability. The Mean value theorem. Taylor polynomials and Taylor series.

Text

S Britton, A Mathas, M Myerscough. *Lecture Notes for MATH1001*. School of Mathematics and Statistics, University of Sydney, 2003.

Reference Books

James Stewart. *Calculus*. Brooks/Cole Publishing Company, 4th edition, 1999.

Hughes-Hallet et al. *Calculus*. John Wiley and Sons Inc, 3rd edition, 2002.

G B Thomas and R L Finney. *Calculus and Analytic Geometry*. Addison Wesley, 9th edition, 1996.

Stanley I Grossman. *Calculus*. Harcourt Brace College Publishers, 5th edition, 1992.

P B Kirkpatrick. *Differential Calculus*. School of Mathematics and Statistics, University of Sydney, 1996.

G P Monro. *Proofs and Problems in the Calculus*. Carlaw, Sydney, Australia, 1996.

R F C Walters and K Wehrhahn. *Calculus 1*. Carlaw, Sydney, Australia, 1989.