

### **MATH1003 Integral Calculus and Modelling**

**3 credit points**

*Assumed knowledge:* HSC Mathematics Extension 2 or MATH1001 or MATH1901.

*Prohibition:* May not be counted with MATH1903 or MATH1013 or MATH1907.

*Contact Hours:* 6 per week (Summer School), or 3 per week (Semester 2).

*Assessment:* One 1.5 hour examination and assigned work.

**Integration.** In this section of the unit the definite integral is defined as a Riemann sum, and the Fundamental Theorem of Calculus (parts 1 and 2) is discussed. The logarithm function is defined as an integral, and the exponential function as its inverse. Applications of integration, such as determining areas and volumes by slicing, are studied. New techniques of integration are introduced: trigonometric and hyperbolic substitution; integration by parts; partial fractions.

**Differential equations and modelling.** An introduction to the use of first and second order differential equations to model a variety of scientific phenomena. Mathematical modelling is a process in which mathematical relationships are proposed between quantities obtained from empirical data. In turn these mathematical relationships are used to forecast likely outcomes and the forecasts are tested against known outcomes.

Types of differential equations include: First order separable (including logistic), first order linear and second order homogeneous linear. Systems of two first order linear equations are also studied.

The treatment includes geometric (direction fields) and symbolic interpretation of differential equations.

#### ***Text***

N R O'Brian, C J Durrant and D J Galloway. *Integral Calculus and Modelling*. School of Mathematics and Statistics, University of Sydney.

#### ***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.

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