THOMPSON RIVERS UNIVERSITY

Course Outline

Department of Mathematics and Statistics
School of Advanced Technologies and Mathematics

MATH 114 – 3 Credits
Calculus I (3,1,0)
Winter, 2010

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Calendar Description

This course covers differential calculus for functions of one variable, with applications emphasizing the physical sciences. Topics include calculation and interpretation of limits and derivatives, curve sketching, optimization and related-rate problems, and Newton's method. The Computer Algebra System "Maple" is introduced as a tool for calculus.

Education Objectives/Outcomes

On completion of the course, students will be expected to:

1. understand the mathematical concept of a limit;
2. interpret, calculate and apply limits numerically and graphically;
3. understand the derivative as a limit describing the instantaneous rate of change of a quantity;
4. use the derivative to provide information about the function from which it is derived;
5. interpret, calculate and apply derivatives in three basic mathematical contexts: symbolic, numerical and graphical;
6. recognize when to use the derivative in solving applied problems, particularly in the physical sciences, and be able to interpret the results.

Prerequisites

At least C+ in Principles of Math 12 or MATH 100 within the last two years or at least C+ in MATH 061 within the last two years.

Students who have never studied calculus before, or who barely satisfy the course prerequisites, are advised to register in a section vectored (5,0,0).

Texts/Materials

Required:
James Stewart, *Calculus: Concepts and Contexts*, 4th Edition, Thomson Brooks/Cole, 2009.

Recommended:
Student's Solutions Manual to accompany *Calculus: Concepts and Contexts*.

Student Evaluation

Weekly quizzes (×8) 10%
Midterm exams (×2) 50%
Final exam 40%

Missed quizzes and exams will result in a mark of zero unless the student provides a valid reason and receives prior approval from the instructor.

Use of Technology

Each student is expected to have a basic scientific calculator. Graphing and programmable calculators will be prohibited on all quizzes and exams. There will be some assignments requiring students to use the computer mathematics package MAPLE.

Course Topics

1. **Functions and Models**

   Intervals, Inequalities and Absolute Values ..... App. A
   Review of functions 1.1-1.3

2. **Limits and Derivatives**

   Tangent line & velocity problems 2.1
   The limit of a function 2.2
   Limit laws 2.3
   Continuity and the Intermediate Value Theorem 2.4
   Limits involving infinity 2.5
   Derivatives and rates of change 2.6
   Derivative function 2.7-2.8

3. **Differentiation Rules**

   Polynomials and exponential functions 1.5, 3.1
   Product and quotient rules 3.2
   Trigonometric functions ..... App. C, 3.3
   Chain rule 3.4
   Implicit Differentiation 3.5
   Inverse trigonometric functions 3.6
   Logarithmic functions 1.6, 3.7
   Logarithmic differentiation 3.7
   Rates of Change 3.8
   Linear approximation and differentials 3.8
   Parametric curves 1.7, 3.4

4. **Applications of Differentiation**

   Related rates 4.1
   Maximum and minimum values 4.2
   Curve sketching 4.3
   L'Hôpitals Rule 4.5
   Optimization problems 4.6
   Newton's method 4.7