



CEGEP CHAMPLAIN
ST. LAWRENCE
CHAMPLAIN REGIONAL COLLEGE

MATHEMATICS 201-103-RE

Differential Calculus

Fall 2010

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Ponderation: 3-2-3

Credits: 2 2/3

Prerequisite: Secondary V Mathematics: Technical and Scientific Option (064-506) or Natural Science Option (065-506)

Competencies

In this course you will use the methods of differential calculus to study functional models in the field of Social Science (satisfying objective 022X and partially satisfying objective 022Y for the Social Science Program). You will also apply what has been learned to one or more subject in the Social Sciences (partially satisfying objective 022N for the Social Science Program).

Learning Objectives

The calculus courses introduce the student to that branch of mathematics called analysis. In this course the student will learn to apply differential calculus methods to the study of functions and to problem solving. To meet this objective, the student will learn:

- 1) to situate the historical context of the development of differential calculus;
- 2) to recognize and describe the characteristics of algebraic, exponential, logarithmic and trigonometric functions expressed in symbolic or graphic form;
- 3) to analyse the behaviour of a function represented in symbolic or graphic form using an intuitive approach to the concept of limits;
- 4) to define the derivative of a function, to interpret it and apply derivative techniques;
- 5) to analyse the variations of a function using differential calculus;
- 6) to solve optimization and rate of change problems.
- 7) to calculate the limits of a function with indeterminate forms using L'Hopital's rule.

Teaching Method

The course is given in an interactive lecture form, with frequent interludes for you to try out the ideas being considered.

Textbook (Optional)

Applied Calculus for the Managerial, Life, and Social Sciences by S.T. Tan, P Menz, D Ashlock, Nelson (2009). Included with the book is the software *Maple – Student Version* (if bought at the bookstore).

Calculator

Only the Sharp EL531 will be permitted for tests and examinations. It may be purchased at the bookstore.

Additional References

Calculus: early transcendentals (7th edition) by H. Anton, I. Bivens and S. Davis, Wiley (2002).

Calculus for Business, Economics, and the Social and Life Sciences (7th edition) by L.D. Hoffmann and G.L. Bradley, McGraw Hill (2000).

Single Variable Calculus: early transcendentals (6th edition) by J. Stewart, Brooks/Cole (2008).

Course Content

- 0) Review of Basic Algebra, Analytical Geometry and Functions – Factoring, inequalities, absolute value, definition of basic algebraic functions and piece-wise defined functions, domain, range, functional notation, review of transcendental functions.
- 1) Limits: intuitive approach and graphic definition, theorems on limits, the evaluation of limits, continuity at a point and on an interval, the derivative.
- 2) Derivatives: definition, geometric interpretation of the derivative, other interpretations of the derivative, rates of change, derivatives of power functions, products and quotients, the chain rule, implicit differentiation, higher order derivatives, logarithmic differentiation, differentials and linear approximations, analysis theorems.
- 3) Applications: curve sketching (horizontal tangents, increasing and decreasing functions, concavity, points of inflection), optimization (maxima and minima), related rates, marginal analysis.
- 4) Differentiation of the Transcendental Functions: differentiation of the trigonometric functions, the inverse trigonometric functions, the logarithmic and exponential functions.
- 5) Limits Revisited: Indeterminate forms of the first and second type, l'Hôpital's Rule.

Evaluation

The evaluation in this course will verify that you have learned:

- 1) to use the appropriate concepts;
- 2) to represent situations through the use of functions;
- 3) to sketch exact graphic representations of functions;
- 4) to perform algebraic operations in conformity with rules.
- 5) to correctly select and apply the rules and techniques;
- 6) to perform accurate calculations;
- 7) to justify the steps you have taken in problem solving;
- 8) to correctly interpret results;
- 9) to use the appropriate terminology (notation).

There will be four term tests, four assignments and a final evaluation consisting of a final exam. The midterm and final grade will be calculated as follows:

	<u>Midtem grade</u>	<u>Final Grade</u>
Tests	2 at 40% each	4 at 12% each
Assignments	2 at 10% each	4 at 3% each
Final Exam	-	40%

If a student is absent for a test due to a College-authorized reason (see the *Institutional Policy on the Evaluation of Student Achievement (IPESA)*, section 2.7 on the SLC web site <http://www.slc.qc.ca/>), then a make up evaluation will be given, otherwise a student will be given zero (0). Late assignments will be severely penalised (10% taken off per day), and will not be accepted once I have given back the graded assignments.

Tests and assignments (including the final examination) will be graded on the proper use of English and Mathematics. That means that written passages must be grammatically correct and that proper mathematical style and notation will be required. Improper use may result in a loss of up to 15% of the grade.

Absences

Attendance is mandatory and a maximum of 7 absences will be tolerated (explained and/or unexplained). More than the 7 absences may mean failure in the course (see section 5.2 of the IPESA).

Rules & Regulations

St. Lawrence has definite regulations concerning cheating and plagiarism. Any student caught cheating or plagiarizing on an assignment or a test will automatically receive a zero for that assignment or test. If a student is caught a second time, automatic failure in the course will result and disciplinary action may be taken. For more information, the student can consult section 5.5 of the IPESA where these rules are clearly indicated.