



CEGEP CHAMPLAIN  
ST. LAWRENCE  
CHAMPLAIN REGIONAL COLLEGE

## MATHEMATICS 201-NYA-05

### Differential Calculus

### Fall 2010

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**Ponderation:** 3-2-3

**Credits:** 2 2/3

**Prerequisite :** Math 536 (High School Math)

#### Programme Objectives

This course will contribute to the goals of the Science Programme graduate profile. You will learn

- 1) to solve problems systematically;
- 2) to reason logically;
- 3) to communicate in a clear and precise fashion;
- 4) to use previously acquired knowledge when dealing with new situations;
- 5) to use the appropriate information technologies;
- 6) to work autonomously;
- 7) the historical context of the concepts taught;
- 8) appropriate attitudes.

#### Course Objectives

The calculus courses introduce the student to that branch of mathematics called analysis. In this course you will use the methods of differential calculus to study functions and problem solving (satisfying objective 00UN and partially satisfying objective 00UP). To meet this objective, the student will learn:

- 1) to recognize and describe the characteristics of functions expressed algebraically or graphically;
- 2) to determine if a given function has a limit, is continuous, and is differentiable at a certain point or interval;
- 3) to apply the rules and techniques of differentiation;
- 4) to use the derivative and relevant notions to analyze variations in functions and sketch their graphs;
- 5) to solve optimization and rate-of-change problems;
- 6) to calculate the limits of indeterminate forms.

#### 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)

*Single Variable Essential Calculus: Early Transcendentals* by J. Stewart, Thomson Brook/Cole (2007).

#### Calculator

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

#### Additional References

*Calculus: Brief Edition (7th Edition)* by Howard Anton, Irl Bivens and Stephen Davis, John Wiley & Sons (2002).

*Calculus of a Single Variable (7th Edition)* by Ron Larson, Robert P. Hostetler and Bruce H. Edwards, Houghton Mifflin (2002).

## 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 scientific interpretations of the derivative, rates of change, derivatives of power functions, products and quotients, the chain rule, implicit differentiation, parametric equations\*, higher order derivatives, 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.
- 4) Differentiation of the Transcendental Functions: differentiation of the trigonometric functions, the inverse trigonometric functions, the logarithmic and exponential functions, the hyperbolic functions\*.
- 5) Limits Revisited: Indeterminate forms of the first and second type, l'Hôpital's Rule, logarithmic differentiation.

\* These topics will only be covered if time allows.

## 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 choose and apply correct differentiation techniques;
- 5) to manipulate algebraic expressions correctly;
- 6) to arrive at exact answers;
- 7) to arrive at correct interpretations of results;
- 8) to justify the steps you have taken in problem solving;
- 9) to use the appropriate terminology (notation).

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

	<u>Midterm 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 5 absences will be tolerated (explained and/or unexplained). More than the 5 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.