Math 190

Calculus Survey

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<u>Course Objectives</u>

This 4-credit course will provide students with the basic quantitative skills necessary for an undergraduate degree in forestry. Undergraduate students in forestry take a very broad range of courses many of which require a general understanding of functions or specific mathematical applications. A general understanding of functions will include the following topics; composition, exponential and logarithmic functions, trigonometric functions (sine, cosine, tangent). The students should develop their ability to build up complicated functions from simpler ones or to understand complicated expressions for functions by breaking them down to simpler ones. The topics covered will include Differential Calculus including derivatives as slopes/growth rates, and Integral calculus as areas and sums; in addition the Chain rule (using function composition) and Integration by Parts are covered.

This course would not preclude credit for a later differential calculus course and moreover would provide excellent background for less prepared students who wish to take MATH 100.

Problem solving is the cornerstone of mathematics instruction. Students must learn the skills of effective problem solving, which include the ability to:

- *read and analyze a problem*
- *identify the significant elements of a problem*
- *select an appropriate strategy to solve a problem*
- *work alone or in groups*
- *verify and judge the reasonableness of an answer, and*
- *communicate solutions.*

Acquiring these skills can help students become reasoning individuals able to contribute to society. Becoming a mathematical problem solver requires a willingness to take risks and persevere when faced with problems that do not have an immediately apparent solution. (BC Ministry of Education, Calculus 12 Integrated Resource Paper, http://www.bced.gov.bc.ca/, last accessed 2012).

Course Format

There will be three one hour lectures per week and one 1.5 hour tutorial. The instructor will begin the (mandatory) tutorial with introductory remarks and example problems. Currently, this involves having students work at the board and having the instructor summarize and correct. The remainder of the tutorial period will be available for help with the current problem set. The weekly problem sets will give the students practice in applying the material covered in the lectures.

Grading

Homework   10%

> Late Labs; deduct 10% of lab value per day late including weekends (working in groups is permitted; however, you must hand in your own work).

In Class Quizzes   15%

> There will be six pop quizzes during the lectures; the best four will be counted towards the final mark. The quizzes will not require a calculator; however, you will need your formula sheet. Your formula sheet must conform to the rules identified in this syllabus. The mark for a missed quiz is zero.

Exam 1   30%

Exam 2   45%

Course Requirements

Principles of Math 12 and admission to either the Forest Resources Management or Natural Resources Conservation programs.

Example Text

Stewart James, *Single Variable Calculus: Early Transcendentals*, seventh edition, Brooks and Cole, 2003.

Suggested References

For background help in algebra a useful website is
    http://www.purplemath.com/index.htm
Development of the logistic growth model
    hhttp://www.duke.edu/education/ccp/materials/diffeq/logistic/

Course Outline

Topic	Week
1. Review rules for exponents, polynomials, functions, radians, trigonometric functions.	1,2
2. Systems of linear equations and exponential function and logarithms.	3
3. Limits, Sigma notation	4
4. Definition of a Derivative	5
5. Derivative Rules	6
6. Word Problems 1 (related rates)	7
7. Review	8
8. Exam 1	**9**
9. Definition of an Integral	9
10. Definite and indefinite integrals	10
11. Integration by substitution, exponential and natural log functions	11
12. Word Problems 2 (kinematics of a point mass), integration by parts	12
13. Review	13

Lab Schedule

Lab Number	Topic	Week
1	Trigonometric functions, polynomials	2
2	Systems of Linear Equations, Logarithms	3
3	Limits, derivatives as a limit	4
4	Derivatives (sums, products, trigonometric, and power functions)	5
5	Derivatives (Chain Rule and higher order derivatives)	6
6	Word problems 1 (related rates), higher order derivatives	7
7	Definite and indefinite integrals	10
8	Integration (substitution)	11
9	Word problems 2 (kinematics of a point mass), integration by parts	12

Instructions for Formula Sheet

You are allowed to

- use both sides of a 8 ½ by 11 sheet of paper,

- organize formulas under headings, and

- include only formulas.

You may not

- use diagrams,

- include tables,

- include written discussions,

- include worked examples, or

- include written definitions of terms.

It is likely you will want to reorganize your formula sheet as you add more information to it. If you want to do this electronically MS Word has an equation editor.

Keep your formula sheet updated every week, and bring the updated copy to all lectures and labs and meetings outside of class with the TAs or the instructor.

Problem Set Marking Scheme

All problem set questions will be marked out of 2

- 0 will be assigned to a question if the marker cannot find a correct answer and the work does not use standard notation and language.

- 1 will be assigned to a question if either there is a correct answer but the work is not presented with standard notation and language, or if the answer is incorrect but there is reasonable work that is clear and presented with standard notation and language.

- 2 will be assigned to a question if the answer is correct and the work is clear and presented with standard notation and language.

Before the TA will mark a problem set the sheets must be stapled together with the class, problem set number, and your name clearly written on the first page.