MATH 250A Intermediate Calculus 1

Course Description
Techniques of integration, indeterminate forms, infinite series, polar coordinates, vector functions, partial derivatives. [3 credits] (*Source*: Camosun College Calendar 2007 – 2008)

Intended Learning Outcomes

Upon completion of this course the student will be able to:

1. Explain what calculus is and how it compares to pre-calculus. Describe the tangent line problem in differential calculus and that the area problem in integral calculus.
2. Use numerical methods, algebraic methods, the squeeze theorem, and the formal limit definition to evaluate limits.
3. Determine continuity at a point and continuity on open or closed intervals. Evaluate one-sided limits. Use the properties of limits to evaluate limits. Apply the Intermediate Value Theorem to locate zeros of a polynomial.
4. Use the chain rule and the power rule to find derivatives of composite and trigonometric functions.
5. Use implicit differentiation to find the derivative of a function.
6. Use pattern recognition, change of variables, and the General Power Rule to evaluate definite and indefinite integral.
7. Evaluate definite and indefinite integrals by fitting an integrand to one of the basis integration rules, the tabular method of integration by parts, trigonometric substitution, partial fractions, and integral tables. Evaluate definite and indefinite integrals of products of trigonometric functions.
8. Use L'Hôpital's rule to evaluate limits involving indeterminate forms.
9. Evaluate improper integrals with infinite limits and with infinite discontinuities.
10. Use infinite geometric series, the nth-Term Divergence test, the Integral Test, p-series, the Direct Comparison Test, the Limit Comparison Test, the Alternating Series Test, the Ratio Test, and the Root Test to determine whether a series converges or diverges.
11. Find Taylor or Maclaurin polynomial approximation of elementary functions. Use Taylor's Remainder Theorem to estimate the error in using a Taylor Polynomial approximation. Find a Taylor or Maclaurin series for a given function. Use the binomial series and other known series to determine Taylor series for other functions.
12. Find a set of parametric equations to represent a given curve. Find the slope of a tangent line to a curve given in parametric form. Find the arc length of a curve given in parametric form. Find the area of a surface of revolution using parametric form.
13. Convert equations in rectangular form to polar form and equations in polar form to rectangular form. Find the slope of a tangent line to a polar graph. Identify the graphs of standard polar equations.
14. Find the area of a region bounded by a polar graph or graphs. Find the arc length of a polar graph. Find the area of a surface of revolution given in polar form.
15. Express equations of conics in polar form. Use polar form to solve problems involving Kepler's Laws.
16. Express vectors in component form and as a linear combination of standard unit vectors. Add and subtract vectors geometrically and use vectors to solve problems involving force and velocity.
17. Understand the three-dimensional coordinate system and use three-dimensional vectors to solve real-life problems.
18. Use the dot product of vectors and the properties of the dot product to find the angle between to vectors, the projection of a vector onto another vector, and to find the work done by a constant force. Find the cross product of two vectors and the triple scalar product of three vectors in space.
19. Express the equation of a line in space in parametric, vector, and standard forms. Express the equation of a plane in space in point-normal, vector and standard forms. Find the distance between points, planes, and lines in space.

20. Recognize and write equations for cylindrical surfaces, quadratic surfaces, and surfaces of revolution. Use cylindrical and spherical coordinates to represent surfaces in space.
21. Extend the concepts of limits and continuity to vector-valued functions. Differentiate and integrate vector-valued functions. Find the velocity and acceleration associated with a vector-valued function. Use vector-valued functions to solve projectile problems. Find a unit tangent vector at a point on a space curve and find the tangential and normal components of acceleration. Find the arc length of a space curve.

Co requisites MATH 251

Organization
In-class workload: 5 hours lecture per week
Out-of-class workload: 5-10 hours per week (or more for students with weaker background)

Textbook
Larson, Hostetler and Edwards, *Calculus*, Eighth Edition, Houghton Mifflin Co., Boston, 2002.

Calculator Policy Unless specified otherwise, graphing calculator (such as Texas Instruments TI-89) allowed in term tests and final exam.

Assignment
- A list of suggested exercises from the textbook is provided at the end of this outline.

Term Tests
- There will be 5 term tests, tentatively scheduled on:

week 2	week 4	week 6	week 8	week 10
3 July (Thurs)	17 July (Thurs)	31 July (Thurs)	13 Aug (Wed)	27 Aug (Wed)

- Thorough understanding of the examples discussed in class and the suggested examples/exercises will be essential for success on the term tests. I like asking questions from the text (example/exercise).
- Complete solutions will be posted online at the class's website.

Final Examination
- The final exam will cover the entire course and will be 3 hours long.
- As stated on page 34 in the current college calendar 2007 – 2008, "Students are expected to write tests and final examinations at the scheduled time and place. … Exceptions, due to emergency circumstances, such as unavoidable employment commitments, health problems, or unavoidable family crisis, require approval of the appropriate instructor. Holidays or scheduled flights are not considered to be emergencies. The student may be required to provide verification of the emergency circumstances."
- Final examination period 8 – 12 September (specific date, time, and location TBA)

Assessment
The final grade will be calculated according to the following breakdown:

5 Term Tests	Final Exam.
$5 \times 10\% = 50\%$	50%

Percentage to Letter Grade Conversion (subject to the weight distribution shown above)

90 to 100 (A+)	85 to 89 (A)	80 to 84 (A-)	77 to 79 (B+)	73 to 76 (B)
70 to 72 (B-)	65 to 69 (C+)	60 to 64 (C)	50 to 59 (D)	0 to 49 (F)

Note: (i) A course with a "D" or "F" grade cannot be used as a prerequisite.
(ii) For final exam numerical grade inquiry, email me your request with your Camosun student ID no.

Student Conduct Policy
There is a Student Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available on the College web site in the Policy Section at http://www.camosun.bc.ca/policies/Education-Academic/E-2-Student-Services-&-Support/E-2.5.pdf

Academic Progress Policy
There is an Academic Progress Policy designed to enhance a learner's likelihood of success. Students should become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.
http://www.camosun.bc.ca/policies/Education-Academic/E-1-Programming-&-Instruction/E-1.1.pdf

Course Content
The course will follow the textbook fairly closely, covering the following topics:

Background (Materials on these sections will be reviewed as needed)

Chapter.Section	Hours	Topic
1.1	Read	A Preview of Calculus
1.2 – 1.4	1	Finding Limits Graphically, Numerically, and Analytically; Continuity and One-Sided Limits
2.1 (optional)	Read	The Derivative and the Tangent Line Problem
2.4	0.5	The Chain Rule
2.5	0.5	Implicit Differentiation
3.9	1	Differentials
3.6 (optional)	Read	A Summary of Curve Sketching
11.1 – 11.2	1	Vectors in the Plane, Space Coordinates and Vectors in Space
4.1, 4.3, 4.4 (optional)	Read	Antiderivatives and Indefinite Integration; Riemann Sums and Definite Integrals; the Fundamental Theorem of Calculus
4.5	1	Integration by Substitution
7.1	1	Area of a Region Between Two Curves
7.4	1	Arc Length and Surfaces of Revolution
7.5 (optional)	Read	Work
7.6 (optional)	Read	Moments, Centers of Mass, and Centroids
Total hours	**7**	

Integration Techniques, L'Hôpital's Rule, and Improper Integrals

Chapter.Section	Hours	Topic
8.1	1	Basic Integration Rules
8.2	2	Integration by Parts
8.3	2	Trigonometric Integrals
8.4	1	Trigonometric Substitution
8.5	1	Partial Fractions
8.6 (optional)	Read	Integration by Table and Other Integration Techniques
8.7	2	Indeterminate Forms and L'Hopital's Rule
8.8	2	Improper Integrals
Total hours	**11**	

Infinite Series

Chapter.Section	Hours	Topic
9.1	1	Sequences
9.2	1	Series and Convergence
9.3	1	The Integral Test and *p*-Series
9.4	1	Comparisons of Series
9.5	1	Alternating Series
9.6	1	The Ratio and Root Tests
9.7	1	Taylor Polynomials and Approximations
9.8	1	Power Series
9.9	1	Representation of Functions by Power Series
9.10	1	Taylor and Maclaurin Series
Total hours	**10**	

Conics, Parametric Equations, and Polar Coordinates

Chapter.Section	Hours	Topic
10.1	1	Conics and Calculus
10.2	2	Plane Curves and Parametric Equations
10.3	1	Parametric Equations and Calculus
10.4	2	Polar Coordinates and Polar Graphs
10.5	1	Area and Arc Length in Polar Coordinates
10.6	1	Polar Equations of Conics and Kepler's Law
Total hours	**8**	

Vectors and Geometry of Space

Chapter.Section	Hours	Topic
11.3 – 11.5	Read(*)	The Dot Product of Two Vectors; The Cross Product of Two Vectors in Space; Lines and Planes in Space
11.6	1	Surfaces in Space
11.7	1	Cylindrical and Spherical Coordinates
Total hours	**2**	

(*): Materials on these sections to be discussed in Math 251 (Matrix Algebra for Engineers).

Vector-Valued Functions

Chapter.Section	Hours	Topic
12.1	1	Vector-Valued Functions
12.2	2	Differentiation and Integration of Vector-Valued Functions
12.3	1	Velocity and Acceleration
12.4	1	Tangent Vectors and Normal Vectors
12.5	1	Arc Length and Curvature
Total hours	**6**	

Lecture	44 hours
Tests	5 hours
Leeway (including Holiday)	6 hours
Total	55 hours

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Office hours: See below (Additional hours available by appointment.)
Website: http://lai.disted.camosun.bc.ca/

	Monday	Tuesday	Wednesday	Thursday	Friday
07:30-08:20		Office Hour	Office Hour	Office Hour	Office Hour
08:30-09:20					
09:30-10:20					
10:30-11:20					
11:30-12:20		Office Hour	Office Hour	Office Hour	Office Hour
12:30-13:20				Office Hour	

23 June 2008 (Monday):	First Lecture
1 July 2008 (Tuesday):	Canada Day (College Closed)
7 July 2008 (Monday):	Last day to drop quarter courses (Fee Deadline)
4 August 2008 (Monday):	British Columbia Day (College Closed)
11 August 2008 (Monday):	Last day to withdraw without a failing grade
1 September 2008 (Monday):	Labour Day (College Closed)
5 September 2008 (Friday):	Last Lecture
8 – 12 September 2008	Final Exam Week

How to do well in the course and where to get help

1. Do not skip classes.

2. Start working on the exercises as soon as we finish a section.

3. Studying in groups is an efficient way to learn mathematics; however, make sure you can solve problems yourself.

4. Extra help available from assistant at the Interurban Math Room: Technologies Centre (TEC) Room 142 (phone: 370-4492). This drop-in centre is freely available for your use to work on math homework and to seek help from the tutor on staff (see hours posted on door).

5. Learning Support and Services for Students
   There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Registrar's Office or the College web site at http://www.camosun.bc.ca

6. Need a tutor/Want to become a tutor? Visit
   http://www.camosun.bc.ca/resources/ses/tutors_list.php

Suggested examples and exercises to practice from the text

Practice as many exercises as you can (try at least one in every group in each section). Instead of reading examples in the text, try solving them yourself and compare your answers with the ones in the text.

Chapter.Section	Try at least one in each group (Eg for example and # for exercise)			
1.2	Eg1, #3	Eg(2, 3, 4, 5)		
1.3	Eg(3, 4, 5)	Eg7, #(51, 52, 57)		Eg8, #(55, 56)
	Eg(9, 10), #(69. 77, 78, 81)			
1.4	Eg2, #(3, 7, 9, 11)		#17	#(45, 57)
2.4	Eg(3, 5, 6, 7, 8, 9, 10, 11, 12), #(15, 29, 38, 43, 45, 65)			
	#(83, 85)		Eg5, #(60, 67(a), 71)	
2.5	Eg(2, 7), #(11, 15)		Eg(5, 8), #(26, 27, 29)	
3.9	Eg3, #(31, 41)			
4.5	Eg(4, 5, 6, 7), #(33, 51, 53, 55, 69)		Eg(8, 9), #(77, 79, 87, 89)	
7.1	Eg(1, 3, 5), #29	Eg4, #43		
7.4	Eg(2, 3), #3	Eg(6, 7), #40		
8.1	Eg1, #(23, 24)	Eg2, #(27, 39)	Eg6, #(41, 77)	
	#(47, 49)	Eg(3, 5), #(19, 21, 29, 37, 63, 65)		
8.2	Eg(2, 3, 5), #(17, 25, 31, 33, 51, 55)			#(35, 81, 93)
	Eg7, #(11, 13, 27, 61, 63)			
8.3	Eg(1, 2, 7), #(5, 7, 9, 71)		Eg3, #(15, 65)	
	Eg8, #51	Eg(4, 5, 6), #(27, 29, 31, 33, 35, 37, 41, 63, 67)		
8.4	Eg1, #(25, 37, 47)		Eg(2, 3), #(31, 33)	
	Eg4, #(27, 51)	#43	#45	
8.5	Eg1, #(11, 13, 14, 15)		Eg2, #(17, 19)	
	Eg3, #(23, 31)	Eg4		
8.7	Eg1, #(15, 19, 21, 83)		Eg(2, 3), #(27, 35, 69)	
	Eg4, #39b	Eg5, #(44b, 45b)		
	Eg6, #(41b, 47b, 48b, 49b)		Eg7, #(51b, 52b, 53b)	
8.8	Eg(1, 2, 3), #(9, 17, 21, 23, 25, 29, 31, 49)			Eg4, #27
	Eg(6, 7), #(5, 33, 37, 41, 43)		Eg8, #(7, 45, 46)	
	Eg9, #(47, 48)	#19	#(35, 39)	
9.1	Eg1	Eg3	Eg4	Eg5
	Eg(6, 7)	Eg8	Eg9	
9.2	Eg(1b, 2), #(29a, 35, 37)		Eg5, #(13, 15, 61, 67)	
	Eg(3, 6), #(33a, 63, 65, 89a, 89b, 90)			
9.3	Eg(1, 2, 4), #(1, 3, 7, 19, 51, 81)		Eg3, #(29, 33)	#(61, 67)
9.4	Eg(1, 2), #(5, 7, 9, 11, 13)		Eg(3, 4, 5), #(19, 23, 25, 27, 47)	
9.5	Eg(1, 2), #(13, 17, 19, 25, 27)		Eg4, #(37a, 45)	

9.6	Eg(1, 2), #(17, 21, 23, 27, 29, 31)		Eg4, #(37, 41, 43)	
	Eg5, #(51, 53, 55, 57, 59, 61, 67)			
9.7	Eg4, #29	Eg5, #(13, 23)	Eg8, #(49, 53)	Eg9, #(45, 57)
9.8	Eg(2, 3, 4)	Eg(5, 6, 7), #(17, 19, 21, 23, 27, 28, 29)		
9.9	Eg2, #5	Eg3	Eg(4, 5), #21	#(39, 41)
9.10	Eg1, #3	Eg(3, 6, 8), #29		Eg(4, 5)
	Eg7a, #31	Eg9, #(55, 57)		
10.1	Eg1, #(13, 15, 21, 23)		Eg3, #(41, 43)	
	Eg7, #(49, 51, 57, 61, 63)			
10.2	Eg(2, 3), #(1d, 2d, 7, 15, 39, 41)			
10.3	Eg2, #15	Eg4, #49	Eg6, #(67, 69, 71)	
10.4	#13		Eg3, #(37, 38, 39, 41, 53)	
	Eg4, #(81, 83, 89, 101)			
10.5	Eg(1, 2, 3), #(5b, 9, 21, 25, 39)		Eg4, #(47, 48)	Eg5, #(55, 57)
10.6	Eg(1, 2)	#(33, 35, 37, 39, 41, 43)		
11.1	Eg1	Eg2, #(5, 9, 11)		Eg(3, 5), #23
	Eg4	Eg(6, 7)		
11.2	Eg1	Eg2, #(39, 41, 43)		Eg(3, 6), #57
	Eg(4, 5)	Eg7		
11.6	eg1, #(7, 11, 13, 15)	Eg2, #(21, 22)	Eg3, #23	Eg4, #29
	Eg5	Eg6	#25	#27
11.7	Eg1	Eg2	Eg3, #(15, 17)	
	Eg4, #(21, 23, 25, 27)	Eg5, #45	#31	#(49, 51, 53, 55)
12.1	Eg1	Eg2	Eg3, #(47, 49, 51, 55, 56)	
	Eg4	Eg5		
12.2	Eg1	Eg2, #(23, 25, 27)		Eg3
	Eg4	Eg(5, 6, 7), #(51, 55, 59, 63, 65, 67)		
12.3	Eg(1, 2, 3)	Eg4, #(21, 22)	Eg(5, 6), #(26, 27, 37, 41)	
12.4	Eg(1, 2), #15	Eg(3, 4), #(23, 33)		
	Eg(5, 6, 7), #(35, 55)			
12.5	Eg(1, 2), #(5, 7, 10, 13)		Eg3	Eg4, #21
	Eg5, #(23, 25, 27, 37, 39)		Eg6, #(43, 55, 57)	
	Eg7			