



COURSE OUTLINE

The course description is online @ <http://camosun.ca/learn/calendar/current/web/math.html>

- * Please note: the College electronically stores this outline for five (5) years only.
It is **strongly recommended** you keep a copy of this outline with your academic records.
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

Instructor:	Raymond Lai
Office Hours:	Monday, Wednesday, Thursday : 11:30 am – 12:20 pm Tuesday: 10:30am-11:20am
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Website:	https://sites.camosun.ca/raymondlai/

2. 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 two 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.

3. Required Materials

- (a) Texts: (Optional Reference) Edwards and Penney, *Calculus Early Transcendentals*, Seventh Edition, Pearson Prentice Hall, 2008.
- (b) Other: Non-graphing non-programmable scientific calculator.

4. Course Content and Schedule

Unit 1: Derivative

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| Section 1 | (Reference: sections 2.1 and 3.2) Tangent Line Problem and Basic Differentiation Rules |
| Section 2 | (Reference: sections 3.2, 3.3 and 3.4) The Chain Rule |
| Section 3 | (Reference: section 3.7) Derivatives of Trigonometric Functions |
| Section 4 | (Reference: sections 3.8 and 6.7) Exponential and Logarithmic Functions: Inverse Functions, Laws of Exponents, Laws of Logarithms, and Derivatives |
| Section 5 | (Reference: section 6.8) Derivatives of Inverse Trigonometric Functions |
| Section 6 | (Reference: section 3.9) Implicit Differentiation |

Unit 2: Techniques of Integration and Applications of Integral

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| Section 7 | (Reference: sections 5.2 and 5.5) General Power Rule |
| Section 8 | (Reference: section 5.1, 5.8) Areas of Plane Regions |
| Section 9 | (Reference: sections 5.2, 5.7 and 7.2) Integration by Substitution: Pattern Recognition |

- Section 10 (Reference: section 6.7) Integration of Exponential Function
- Section 11 (Reference: section 6.8) Inverse Trigonometric Functions
- Section 12 (Reference: section 7.3) Integration by Parts (Tabular Method)
- Section 13 (Reference: section 7.4) Trigonometric Integrals
- Section 14 (Reference: section 7.5) Integration of Rational Functions by using Partial Fractions
- Section 15 (Reference: section 7.6) Trigonometric Substitutions

Unit 3: Limits, Indeterminate Forms, and Improper Integrals

- Section 16 (Reference: sections 2.2 and 2.3) Review of Limits: Numerical Method, Algebraic Method, Properties, Squeeze Theorem, and One-Sided Limits
- Section 17 (Reference: section 2.4) Continuity and the Intermediate Value Theorem
- Section 18 (Reference: section 4.8) Basic Indeterminate Forms and L'Hôpital's Rule
- Section 19 (Reference: section 4.9) More Indeterminate Forms
- Section 20 (Reference: section 7.8) Improper Integrals: Infinite Limits and Infinite Discontinuities

Unit 4: Parametric Curves

- Section 21 (Reference: section 9.4) Slope of Tangent Line
- Section 22 (Reference: section 9.5) Arc Length and Area of Surface of Revolution

Unit 5: Polar Coordinates

- Section 23 (Reference: sections 9.2, 9.4) Conversion to/from Rectangular Coordinates, Polar Graphs, and Slope of Tangent Line
- Section 24 (Reference: sections 9.3, 9.5) Arc Length, Area, and Area of Surface of Revolution
- Section 25 (Reference: section 9.6) Conic Sections in Polar Form

Unit 6: Infinite Series

- Section 26 (Reference: section 10.3) Infinite Series and Convergence: Geometric Series and n^{th} Term Divergence Test
- Section 27 (Reference: section 10.5) The Integral Test and the p -series Test
- Section 28 (Reference: section 10.6) Direct Comparison Test and Limit Comparison Test
- Section 29 (Reference: section 10.7) The Alternating Series Test
- Section 30 (Reference: section 10.7) The Ratio Test and the Root Test
- Section 31 (Reference: sections 10.4, 10.8 and 10.9) Taylor Polynomials, Taylor's Remainder Theorem, Taylor Series and their Operations

Unit 7: Vectors

- Section 32 (Reference: sections 11.1 and 11.2) Two-Dimensional Vectors in Plane and Three-Dimensional Vectors in Space: Representations, Equality, and Algebraic Operations
- Section 33 (Reference: section 11.2) Applications of Vectors: Angle and Work Done
- Section 34 (Reference: section 11.3) Operations specific to Vectors in Space: Cross Product and Triple Scalar Product
- Section 35 (Reference: sections 11.2, 11.4) Lines and Planes in Space; Distances between Points, Lines, and Planes

Unit 8: Curves and Motion in Space with Vector-Valued Functions

Section 36 (Reference: sections 11.5, 11.6) Velocity, Acceleration, and Arc Length; Projectiles

Section 37 (Reference: section 11.6) Tangential and Normal Components of Acceleration

Lectures, Reviews, Help Sessions	Tests	Holiday	Total
66 hours	4 hours	0 hour	70 hours

5. Basis of Student Assessment (Weighting)

	Test 1	Test 2	Test 3	Test 4
Tentative Date	Thurs Sept 28	Thurs Oct 26	Thurs Nov 23	Thursday Dec 7
Weight	25%	30%	30%	15%

There is no makeup for missed test (except for documented medical reasons).

There will be no final exam.

To get a C or higher in the course, you must have an overall average of 60% or higher. (See the section "Grading System" below.)

6. Grading System

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at camosun.ca for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. (For these courses a final grade will be assigned to either the 3 rd course attempt or at the point of course completion.)
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed in the Course

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, at Student Services, or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services, and the College web site in the Policy Section.

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. It is important to understand the principles involved rather than to memorize a method of solution – try variations of questions.
4. Study efficiently:
 - Working in groups is a smart way to learn mathematics; however, make sure you can solve problems yourself.
 - Keep and organize your work: Doing so will be a big time saver before term tests as you won't have time to redo all the exercises.
 - It is important **not** to spend too much time on a single exercise – as a general rule of thumb, if you spend 15 minutes either staring at a problem not knowing what to do or having trouble finding arithmetic mistakes you might have made, move on (bring me your work and we can go over it together – there may be typo in the answer provided, check typo corrections posted on the course website).
5. Extra help available from assistant at the Math Lab located at 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 the door).