



North Vancouver Online Learning

Course Plan: Calculus 12
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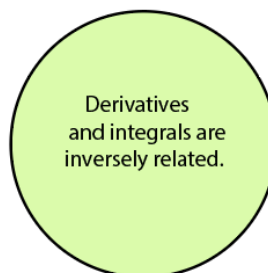
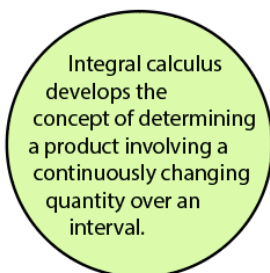
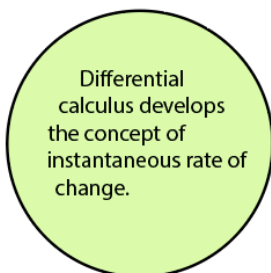
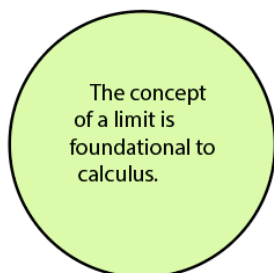
COURSE DESCRIPTION:

The Calculus 12 course follows the BC Provincial curriculum and satisfies the requirements for graduation and entrance into many post-secondary institutions or programs. This pathway is designed to provide students with the mathematical understandings and critical-thinking skills identified for entry into post-secondary programs that require the study of theoretical calculus. Students will express their learning of the core competencies through; reasoning and modelling, understanding and solving, communicating and representing, connecting and reflecting.

<https://curriculum.gov.bc.ca/curriculum/mathematics/12/pre-calculus>

BIG IDEAS:

The Big Ideas consist of generalizations, principles, and the key concepts important in an area of learning. They reflect the “Understand” component of the Know-Do-Understand model of learning. The big ideas represent what students will understand at the completion of the curriculum for their grade. They are intended to endure beyond a single grade and contribute to future understanding.



CORE COMPETENCIES:

A Core Competency is a skill that all learners need to have to be successful in all aspects of their life. There are 3 core competencies: Communication (Communicating & Collaborating), Thinking (Critical Thinking, Creative and Reflective Thinking), Personal (Personal Awareness and Responsibility, Social Awareness and Responsibility and Positive Personal and Cultural Identity).



COURSE EXPECTATIONS:

- It is expected that students will be actively engaged in the online course material. This would include, but is not limited to, viewing online lessons and taking notes, working on practice assignment questions within each unit and completing the learning guide for each unit.
- Teacher-Student communication is essential to a successful course experience, so students need to be good online communicators. The most efficient way of communication is via the messaging system built into the Moodle course environment.
- Students need to be organized, disciplined and industrious self-motivated learners. The self-paced nature of this course requires that students manage their time effectively to complete the course. Successful students make a weekly schedule to plan out the completion of the course.
- At times the course content may be challenging, so students are encouraged to get help and support; however, the onus is on the student to be actively engaged in the online course material in order to be successful.

LEARNING STANDARDS: Curricular Competencies

Students are expected to be able to do the following:

Reasoning and modelling

- Develop thinking strategies to solve puzzles and play games
- Explore, analyze, and apply mathematical ideas using reason, technology, and other tools
- Estimate reasonably and demonstrate fluent, flexible, and strategic thinking about number
- Model with mathematics in situational contexts
- Think creatively and with curiosity and wonder when exploring problems

Understanding and solving

- Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, inquiry, and problem solving
- Visualize to explore and illustrate mathematical concepts and relationships
- Apply flexible and strategic approaches to solve problems
- Solve problems with persistence and a positive disposition
- Engage in problem-solving experiences connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures

Communicating and representing

- Explain and justify mathematical ideas and decisions in many ways
- Represent mathematical ideas in concrete, pictorial, and symbolic forms
- Use mathematical vocabulary and language to contribute to discussions in the classroom
- Take risks when offering ideas in classroom discourse

Connecting and reflecting

- Reflect on mathematical thinking
- Connect mathematical concepts with each other, other areas, and personal interests
- Use mistakes as opportunities to advance learning
- Incorporate First Peoples worldviews, perspectives, knowledge, and practices to make connections with mathematical concepts

Student Substantive Activities will cover the following Learning Outcomes (Curricular Competencies)

- Explore, analyze, and apply mathematical ideas using reason, technology, and other tools
- Visualize to explore and illustrate mathematical concepts and relationships
- Represent mathematical ideas in concrete, pictorial, and symbolic forms

These are 3 of the 18 learning outcomes in the course curriculum, which comprises 16% of the course Learning Outcomes/Activities. ($3/18 = 16\%$)

LEARNING STANDARDS: Course Content

Students are expected to know the following:

- functions and graphs
- limits
- differentiation
- integration

UNIT OVERVIEWS:

Unit 1: Pre-Calculus Review

- Students will explore, analyze, and apply mathematical ideas developed in pre-calculus including parent functions and piecewise functions from Pre-Calculus 12
- Visualize to explore and illustrate mathematical concepts and relationships of inverse trigonometric functions

Big Idea: Differential calculus develops the concept of instantaneous rate of change.

First Peoples Principle of Learning: Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

Unit 2: Limits and Continuity

- Use mathematical vocabulary to describe continuity, end behavior, and limits from table of values, graphically, and algebraically
- Develop, demonstrate, and apply conceptual understanding of mathematical ideas of one-sided versus two-sided limits and the intermediate value theorem

Big Idea: The concept of a limit is foundational to calculus.

First Peoples Principle of Learning: Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

Unit 3: Differentiation

- Students will represent rate of change in concrete, pictorial, and symbolic forms for average versus instantaneous rates and slope of secant and tangent lines
- Students will develop, demonstrate, and apply conceptual understanding of differentiation rules such as power, product; quotient, chain and transcendental functions:

Big Idea: Differential calculus develops the concept of instantaneous rate of change.

First Peoples Principle of Learning: Learning requires exploration of one's identity.

Unit 4: Applications of Derivatives

- Students will use flexible and strategic approaches to applications of derivatives; graphs, concavity, differentiability, mean value theorem
- Model with mathematics in situational contexts the graphs of $f(x)$ to $f'(x)$ and $f''(x)$
- Students will develop thinking strategies to solve problems in contextual situations, including Newton's method, related rates and optimization problems

Big Idea: Differential calculus develops the concept of instantaneous rate of change.

First Peoples Principle of Learning: Learning involves patience and time.

Unit 5: Integration

- Students will develop, demonstrate, and apply conceptual understanding of definition of an integral, and integral notation
- Students will visualize to explore and illustrate mathematical concepts and relationships of Riemann sum, rectangle approximation method, trapezoidal method
- Explore, analyze, and apply mathematical ideas of fundamental theorem of calculus and methods of integration

Big Idea: Integral calculus develops the concept of determining a product involving a continuously changing quantity over an interval

First Peoples Principle of Learning: Learning involves patience and time.

Unit 6: Applications of Integration

- Students will visualize to explore and illustrate mathematical concepts and relationships of area under a curve, volume of solids, average value of functions
- Students will model with mathematics in situational contexts differential equations, initial value problems and slope fields

Big Idea: Integral calculus develops the concept of determining a product involving a continuously changing quantity over an interval

First Peoples Principle of Learning: Learning involves patience and time.

Unit 7: Differential Equations

- Students will connect mathematical concepts with each other, other areas, and personal interests related rates and optimization problems
- Students will explore, analyze, and apply mathematical ideas using reason, technology to solve area under curve and volume of solid problems
- Students will model with mathematics in situational contexts Riemann sum, rectangle approximation method, and trapezoidal method

Big Idea: Derivatives and integrals are inversely related.

First Peoples Principle of Learning: Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)

STUDENT LEARNING ACTIVITIES AND STRATEGIES:

- *Interactive Video Lessons with Audio and Colourful graphics*
- *Note Taking Supplements to accompany the video lessons*
- *Practice Assignment questions for each lesson, with answers*
- *Worked out Video Solutions to every Practice Assignment question*
- *Formative lesson quizzes and unit quizzes*
- *Comprehensive Learning Guide for each unit, with answers*
- *Summative Unit tests and a Final exam.*
- *Full DL Centre access: computers, work space, and teacher support*

ASSESSMENT:

The course grade is calculated from Unit Quizzes (15%), Video Notes and Review (15%), Unit Tests (50%), Project and Final Exam (20%).

Unit-Quizzes 15%

These quizzes are taken online at the convenience of the student. These quizzes are timed, so it is important to be prepared and cognizant of the time when writing the quiz. To ensure that you are ready to take a unit-quiz, review the content pertaining to the quiz and take the practice quiz questions built into the end of each chapter. These practice questions can be taken in an online interactive format with access to answers and complete worked out solutions.

Video Notes and Review 15%

The lessons for this course are delivered in high quality, interactive flash videos. Students are able to print pages to support their note taking while viewing the course content. For each unit there are comprehensive practice questions provided which can be printed out or worked on directly within the course. These practice questions are designed to be completed, with full solutions, as students work their way through the online lessons. Each chapter contains a review assignment which contains a selection of questions to help students prepare for their test. These review assignment contain answers at the end and solutions can be provided upon request.

Unit Tests 40%

Students are welcome to come to the DL Centre at Mountainside to write their test anytime that the DL Centre is open as per the posted schedule. Student do not need to set up an appointment in advance, but should check the DL Centre Schedule on the homepage to make sure the centre is open and that there is enough time before closing to complete the test. Your course instructor does not need to be in the DL Centre for students to write tests as one of the other DL Teachers can supply your test. Please remember to bring ID with when coming in to write a test.

NOTE: In order to meet the prescribed learning outcomes for this course, you are required to pass every written unit test. If you receive a failing grade on any written test, the mark on your corresponding formative assignment will be excluded. You must contact your instructor to discuss a re-test option and to reinstate your formative assignment mark.

Project and Final Exam 20%

The Project is designed for students to demonstrate technological literacy in mathematics. Students are to choose a section of curriculum from the course and create an online lesson that explains the material. The design of the project is to be determined by the interest of the student, but may use screen casting, animation, iMovie, explain everything or many others.

The Final Exam will be a comprehensive exam covering material from the relevant components of the course. The Final Exam will be written in the DL Centre once the course requirements have been completed. When students are ready to write the final exam they should contact their instructor to schedule the exam.

EVALUATION:

Based on performance standards and criteria:

<i>Learning Activity</i>	<i>Assessment Type</i>	<i>Percentage of final Mark</i>
<i>Unit Quizzes</i>	<i>Formative</i>	<i>15%</i>
<i>Unit Video Notes and Review</i>	<i>Formative</i>	<i>15%</i>
<i>Chapter Tests</i>	<i>Summative</i>	<i>50%</i>
<i>Project and Final Exam</i>	<i>Summative</i>	<i>20%</i>
<i>Total</i>		<i>100%</i>

RESOURCES:

There is no textbook required for this course as all of the lessons, notes, assignments, practice quizzes and solutions are contained within the online course. If necessary, and on the recommendation of the teacher, there is a supplemental textbook associated with the course, - **Calculus 12**. This optional resource can be picked up at any time during the course along with a required deposit.