

MCV4U – Calculus and Vectors

GENERAL INFORMATION

Name of School: Rosedale Academy

Department: Mathematics

Course Developer: Asim Sayed

Development Date: September 15, 2014

Revision Date: August 2018

Course Title: Calculus and Vectors

Grade: 12

Course Type: University Preparation

Course Code: MCV4U

Credit Value: 1

Curriculum Policy Document: The Ontario Curriculum Grades 11 and 12 Mathematics, Ministry of Education 2007 (Revised)

Prerequisite: Grade 12 Advanced Functions, University, must be taken prior to or concurrently with Calculus and Vectors

COURSE DESCRIPTION

This course builds on students' previous experience with functions and their developing understanding of rates of change. Students will solve problems involving geometric and algebraic representations of vectors and representations of lines and planes in three-dimensional space; broaden their understanding of rates of change to include the derivatives of polynomial, sinusoidal, exponential, rational, and radical functions; and apply these concepts and skills to the modeling of real-world relationships. Students will also refine their use of the mathematical processes necessary for success in senior mathematics. This course is intended for students who choose to pursue careers in fields such as science, engineering, economics, and some areas of business, including those students who will be required to take a university-level calculus, linear algebra, or physics course.

PART OVERALL EXPECTATION / LEARNING OBJECTIVES

Rate of Change

1. Demonstrate an understanding of rate of change by making connections between average rate of change over an interval and instantaneous rate of change at a point, using the slopes of secants and tangents and the concept of the limit;
2. Graph the derivatives of polynomial, sinusoidal, and exponential functions, and make connections between the numeric, graphical, and algebraic representations of a function and its derivative;
3. Verify graphically and algebraically the rules for determining derivatives; apply these rules to determine the derivatives of polynomial, sinusoidal, exponential, rational, and radical functions, and simple combinations of functions; and solve related problems.

Derivatives and their Applications

1. Make connections, graphically and algebraically, between the key features of a function and its first and second derivatives, and use the connections in curve sketching;
2. Solve problems, including optimization problems that require the use of the concepts and procedures associated with the derivative, including problems arising from real-world applications and involving the development of mathematical models.

Geometry and Algebra of Vectors

1. Demonstrate an understanding of vectors in two-space and three-space by representing them algebraically and geometrically and by recognizing their applications;
2. Perform operations on vectors in two-space and three-space, and use the properties of these operations to solve problems, including those arising from real-world applications;
3. Distinguish between the geometric representations of a single linear equation or a system of two linear equations in two-space and three-space, and determine different geometric configurations of lines and planes in three-space;
4. Represent lines and planes using scalar, vector, and parametric equations, and solve problems involving distances and intersections.

OUTLINE OF COURSE CONTENT

	Name of Unit	Time Allocated in Hours
Unit 1	Rate of Change	40 Hours
Unit 2	Derivatives and their Applications	30 Hours
Midterm report cards		
Unit 3	Geometry and Algebra of Vectors	40 Hours
	Final Examination	
	TOTAL	110 Hours

TEACHING / LEARNING STRATEGIES

The strategies used are varied to meet the needs and the range of learning styles encountered and they include the following:

Articulate Learning Module	Brainstorming
Computer Assisted Learning	Decision Making
Direct Instruction	Demonstration
Animated Games	Discussion
Group Discussion	Estimating
iSpring Presentation / Animation	Independent Study
Online Graphing Software	Memorization
Problem-Based Learning	Model Analysis
Work and Task Sheet	Note Taking
Interactive Online Activity	Oral Explanation
	Peer Assessment
	Problem Solving
	Reasoning and Proving
	Self-Assessment

STRATEGIES FOR ASSESSMENT AND EVALUATION OF STUDENT PERFORMANCE

Evaluation in this course will be continuous throughout the year and will include a variety of evaluation methods. Assessment is embedded in the lessons throughout a unit under Check-Up Time.

Assessment as Learning	Assessment for Learning	Assessment of Learning
Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Learning Logs (anecdotal) <input type="checkbox"/> Peer Assessments <input type="checkbox"/> Practice Worksheets 	Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Check-up Time Assessments <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Pre-Skills Checks (scale) <input type="checkbox"/> Quizzes (scale) <input type="checkbox"/> Graphic organizers (scale) <input type="checkbox"/> Peer feedback (anecdotal) <input type="checkbox"/> Reports <input type="checkbox"/> Practice Worksheets 	Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Assignments <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Unit Tests (scale) <input type="checkbox"/> Final Exam <input type="checkbox"/> Case Studies <input type="checkbox"/> Presentations <input type="checkbox"/> Graphic organizers (scale)
Observation <ul style="list-style-type: none"> <input type="checkbox"/> Whole class discussions (anecdotal) <input type="checkbox"/> Self-proofreading (checklist) 	Observation <ul style="list-style-type: none"> <input type="checkbox"/> Class discussions (anecdotal) <input type="checkbox"/> Problem Solving 	Observation <ul style="list-style-type: none"> <input type="checkbox"/> Presentations
Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Student teacher conferences <input type="checkbox"/> Small Group Discussions (checklist) <input type="checkbox"/> Pair work (checklist) <input type="checkbox"/> Skype meetings 	Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Student teacher conferences <input type="checkbox"/> Small group discussions (checklist) <input type="checkbox"/> Pair work (anecdotal) <input type="checkbox"/> Peer-feedback (anecdotal) <input type="checkbox"/> Peer-editing (anecdotal) 	Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Question and Answer Session (checklist) <input type="checkbox"/> Oral tests (scale) <input type="checkbox"/> Oral Presentation with question and answer session

FINAL GRADE

The percentage grade represents the quality of the students' overall achievement of the expectations for the course and reflects the corresponding achievement as described in the achievement chart for mathematics.

1. Term work will be 70% of the overall grade for the course;
2. The summative evaluations will be 30% of the overall grade, incorporating a final written examination.

Achievement Categories

Application:	25%	Knowledge and Understanding:	25%
Communication:	25%	Thinking/Inquiry:	25%

Achievement Chart

A Summary Description of Achievement in Each Percentage Grade Range And Corresponding Level of Achievement

Percentage Grade Range	Achievement Level	Summary Description
80–100%	Level 4	A very high to outstanding level of achievement. Achievement is above the provincial standard.
70–79%	Level 3	A high level of achievement. Achievement is at the provincial standard.
60–69%	Level 2	Moderate level of achievement. Achievement is below, but approaching the provincial standard.
50–59%	Level 1	A passable level of achievement. Achievement is below the provincial standard
Below 50%	Level R	Insufficient achievement of curriculum expectations. A credit will not be granted

RESOURCES REQUIRED BY THE STUDENT

MCV4U Online Course of Study

Graphing Calculators are highly recommended

PROGRAM PLANNING CONSIDERATION

Role of Technology in the Curriculum

Rosedale Academy courses leverage the power of information and communication technologies to provide rich, dynamic learning experiences. Students explore, evaluate and create concepts and works using a wide array of digital tools. They demonstrate their learning through text, video, voice and visual assignments that teach multi-literacy and media skills. Students also enhance their computer and technology skills in ways that are useful for their future academic and personal pursuits.

Teachers at Rosedale Academy get to know their learners, provide rich, descriptive feedback and assess student contributions and products AS, FOR and OF learning through digital technologies. They enable rapid feedback and communication at any time without borders in our global community.

Tool	Use	Benefit
Discussion forums	Whole class discussion (written)	Creates a record of each student's contributions
Group activities	Small group collaboration and discussion (written)	Encourages student participation; creates a record
Live Skype sessions	Teacher leads the lesson with students as a class	Observations of whole class and individual students
Databases	Students upload words, phrases, files, surveys, etc. to the database for peer assessment, presentation, or research	Student-centered data, peer assessment (as learning)
Peer Teaching	Students research a given topic and share their findings and opinions with other students.	Fosters discussion between students and allows for content to be learned and expressed from a student perspective
Journals	Small group discussions using problem solving	Improves students' critical inquiry, and reflective thinking skills about the concepts learned within the course
Learning Modules	Students explore content in an interactive manner with built-in assessments as they progress.	Students can navigate content at their own pace and assess their own learning along the way.
Computer Simulations	Individual or class exploration and visualization of concepts relating to the curriculum.	Allows hands-on exploration and investigation as an alternative learning strategy.

English as a Second Language

Rosedale Academy provides students with comprehensive ESL support to enhance their proficiency with the English language.

- All Rosedale Academy instructional materials and resources are designed with English Language Learners in mind. Online and face-to-face instructional resources make use of differentiated learning methods and carefully structured language. These resources support English language development as students are taking credit courses in all academic fields.
- Teachers at Rosedale Academy provide a variety of accommodations for English Language Learners. These accommodations include: extended time for tests and exams; chunking of assignments and tests; a safe space for asking questions; formative feedback; mini-lessons in spelling, sentence structure and grammar; and access to ESL resources and expert discussion.
- The self-paced delivery method of this course allows students to take the time that they require to engage in meaningful participation while still enjoying the enriching experience of working in an online global classroom.
- All teachers at Rosedale Academy are responsible for helping students to develop their ability to use English in academic courses.

Career Education

This course promotes skills effective for a variety of careers and informs students of some of the career opportunities where oral and written communication is considerable assets. Students will learn how to use English to inform audiences about ideas, persuade audiences to change their opinion or buy a product, and to formulate ideas. Students will also understand the importance of social media in their search for future education and career opportunities. Finally, this course also helps to prepare students for university application by providing a unit that helps them write a persuasive application essay. Beyond the immediate needs of the student, this also course focuses on demonstrating the value of English in jobs like business where clear communication is highly valued.

Academic Integrity

Students are expected to maintain high standards of honesty and academic integrity throughout their participation in all courses. This includes avoiding any instance of fraud, plagiarism and cheating. Rosedale Academy takes the following steps to ensure academic integrity:

- Students provide photo identification
- Course assignments include audio and video components
- Teachers Skype weekly with their classes
- Students are encouraged and supported to develop original work
- Exams are proctored by adults in trusted positions

When a teacher has reasonable grounds to believe that a student has violated these standards, the school principal will review the incident and, if needed, enforce disciplinary procedures. More information about *Academic Honesty* may be found in section 5.3 of the school calendar.

Late and Missed Assignment

Independent students have up to 12 months to complete a course. There are no set deadlines for course assignments. Students can proceed through each course at their own pace, but all course requirements must be completed prior to writing their final exam.

Cohort students follow a schedule in each course. This schedule specifies the due dates for all assignments. Students may request an extension if they are unable to meet a specific due date. Rosedale Academy reserves the right to deny any request. Late or missed assignments are not accepted without a valid reason.