

Iroquois Ridge High School
MCV4U—Calculus and Vectors—Course Outline

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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 modelling 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.

What will you be expected to learn? (Key Learnings)

In this course, you will be expected to provide evidence that you can:

PROCESS EXPECTATIONS

- be actively engaged in the following seven processes which are integrated into all areas of the course: *problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating.*

RATE OF CHANGE

- 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;
- 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;
- 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

- 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;
- 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

- demonstrate an understanding of vectors in two-space and three-space by representing them algebraically and geometrically and by recognizing their applications;
- 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;
- 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;
- represent lines and planes using scalar, vector, and parametric equations, and solve problems involving distances and intersections.

You will be expected to demonstrate your understanding of these key learnings through your knowledge, thinking, communication and application of the learning.

<p>Knowledge Emphasizes the ability to recall factual information, recognize fundamental concepts and the foundational skills of the subject/discipline.</p>	15%	Knowledge of content (e.g., facts, terms, procedural skills, use of tools) and understanding of mathematical concepts. These may be assessed through quizzes, tests, oral questions and answers, practice question assignments, etc.
<p>Thinking Emphasizes the thinking skills used in thinking processes to demonstrate the student's understanding of information they have processed.</p>	25%	Use of <i>planning skills</i> : understanding the problem (e.g., formulating and interpreting the problem, making conjectures) and making a plan for solving the problem. Use of <i>processing skills</i> : carrying out a plan (e.g., collecting data, questioning, testing, revising, modelling, solving, inferring, forming conclusions) and looking back at the solution (e.g., evaluating reasonableness, making convincing arguments, reasoning, justifying, proving, reflecting). Use of <i>critical/creative thinking processes</i> (e.g., problem solving, inquiry). These may be assessed through open-ended investigations, inquiry tasks, oral interview, projects, verbal defense, observation of process, etc.
<p>Communication Emphasizes the clear, precise and effective use of oral, written and visual language to communicate the student's understanding of information and ideas.</p>	10%	<i>Expression and organization of mathematical thinking</i> (e.g., clarity of expression, logical organization), using oral, visual, and written forms (e.g., pictorial, graphic, dynamic, numeric, algebraic forms; concrete materials). <i>Communication for different audiences</i> (e.g., peers, teachers) and <i>purposes</i> (e.g., to present data, justify a solution, express a mathematical argument) in oral, visual, and written forms. <i>Use of conventions, vocabulary, and terminology</i> of the discipline (e.g., terms, symbols) in oral, visual, and written forms. These may be assessed through journals, written explanations or reports, teacher-student conferences, solution presentations, problem form scores, etc.
<p>Application Emphasizes the application and integration of knowledge, skills, processes and techniques to produce evidence of the student's understanding.</p>	20%	Application of knowledge and skills in familiar contexts and transfer of knowledge and skills to new contexts. Making connections within and between various contexts (e.g., connections between concepts, representations, and forms within mathematics; connections involving use of prior knowledge and experience; connections between mathematics, other disciplines, and the real world). These may be assessed with rich tasks, open-ended problems, real-world projects and applications, etc.

How will you demonstrate your learning? (what you say, write and do)

70% of your learning will be assessed through:	<i>Formative and Summative Evaluations</i>	See previous section for 70% breakdown.
30% of your learning will be assessed at the end of the course (last four weeks of the semester) through:	<i>Final Evaluation 25%</i>	FINAL EXAMINATION (25%) consisting of a variety of question types (e.g. short answer, multiple choice, extended tasks) sampling all strands and categories of 2.5 hours duration or less.
	<i>Final Evaluation 5%</i>	INQUIRY PERFORMANCE TASK (5%) consisting of a mathematical investigation or contextual, open-ended problematic situation suited to a variety of approaches including use of technology where appropriate.
100% of your learning will be recorded as:	<i>Final Grade on Report Card</i>	

Your skills as a learner will be assessed in the way you demonstrate:

Learning Skill "Look Fors"	
Working Independently	<ul style="list-style-type: none"> • accomplishes tasks independently • accepts responsibility for completing tasks • follows instructions • regularly completes assignments on time and with care • demonstrates self-direction in learning • independently selects, evaluates, and uses appropriate learning materials, resources, and activities • demonstrates persistence in bringing tasks to completion • uses time effectively • uses prior knowledge and experience to solve problems and make decisions • reflects on learning experiences
Teamwork	<ul style="list-style-type: none"> • works willingly and cooperatively with others • shares resources, materials, and equipment with others • responds and is sensitive to the needs and welfare of others • solves problems collaboratively • accepts various roles, including leadership roles • takes responsibility for his or her own share of the work to be done • works to help achieve the goals of the group or the class • helps to motivate others, encouraging them to participate • contributes information and ideas to solve problems and make decisions • questions the ideas of the group to seek clarification, test thinking, or reach agreement • shows respect for the ideas and opinions of others in the group or class • listens attentively, without interrupting • in discussions, paraphrases points of view and asks questions to clarify meaning and promote understanding • recognizes the contribution of group members by means of encouragement, support, or praise • seeks consensus and negotiates agreement before making decisions
Organization	<ul style="list-style-type: none"> • organizes work when faced with a number of tasks • devises and follows a coherent plan to complete a task • follows specific steps to reach goals or to make improvements • revises steps and strategies when necessary to achieve a goal • manages and uses time effectively and creatively • demonstrates ability to organize and manage information • follows an effective process for inquiry and research • uses appropriate information technologies to organize information and tasks
Work Habits/Homework	<ul style="list-style-type: none"> • completes homework on time and with care • puts forth consistent effort • follows directions • shows attention to detail • uses materials and equipment effectively • begins work promptly and uses time effectively • perseveres with complex projects that require sustained effort • applies effective study practices
Initiative	<ul style="list-style-type: none"> • seeks out new opportunities for learning • responds to challenges and takes risks • demonstrates interest and curiosity about concepts, objects, events, and resources • seeks necessary and additional information in print, electronic, and media resources • identifies problems to solve, conducts investigations, and generates questions for further inquiry • requires little prompting to complete a task, displaying self-motivation and self-direction

- approaches new learning situations with confidence and a positive attitude
- develops original ideas and devises innovative procedures
- attempts a variety of learning activities
- seeks assistance when needed
- uses information technologies in creative ways to improve learning for self or others

How will you learn and get help when you are not learning?

Lunch and before or after school in 307, math clinic (second half of lunch, rm 306), and the course website located by clicking the MCV4U1 link at http://chatt.hdsb.ca/~irhs/IRHS_WEB/RidgeMath/

	What are you expected to learn?	How will you demonstrate what you've learned?	
<i>Units</i>	<i>Key Learnings Focus</i>	<i>Your learning will be demonstrated by what you say, write and do.</i>	<i>Texts, Materials & Learning Opportunities</i>
1	Vectors	Assignments, quizzes, tests	Geometry and Algebra text, websites, course notes
2	Lines and Planes	Assignments, quizzes, tests	Geometry and Algebra text, websites, course notes
3	Rates of Change	Assignments, quizzes, tests	Calculus and Functions text, websites, course notes
4	Derivatives	Assignments, quizzes, tests	Calculus and Functions text, websites, course notes
5	Curve Sketching	Assignments, quizzes, tests	Calculus and Functions text, websites, course notes
6	Applications	Assignments, quizzes, tests	Calculus and Functions text, websites, course notes