

Sir Wilfrid Laurier Secondary School

Grade 12 Calculus and Vectors – MCV 4U

1.0 credits

Course Outline

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.

Strands and Overall Expectations

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 & 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 & 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.

Evaluation

The final report card mark will be determined according to the **student's overall achievement of all of the course expectations** as set out in The Ontario Curriculum Mathematics documents. Students will be given **multiple and varied opportunities to demonstrate their achievement of the expectations within each strand** throughout the term (70% of final grade) as well as in the summative activity and final exam (total 30% of final grade).

The student demonstrates, in all of the overall expectations, specified knowledge and skills with:

a high degree of effectiveness	Level 4 (80-100)	Achievement surpasses the provincial standard.
considerable effectiveness	Level 3 (70-79)	Achievement represents the provincial standard .
some effectiveness	Level 2 (60-69)	Achievement is approaching provincial standard.
limited effectiveness	Level 1 (50-59)	Achievement falls much below the provincial standard.
	Below Level 1 (49 and below)	*Student does not achieve at least <i>limited effectiveness</i> in <u>all</u> overall expectations.

Guidelines for Missed Evaluations and Academic Fraud

1. Upon missing a test or presentation, students will be required at the teacher's discretion, either to:
 - a) Complete the test or presentation immediately upon return to school; or
 - b) Make arrangements with the teacher for a make-up; or
 - c) Write the missed test Friday morning at 7:30 a.m. of that week.

Failure to complete the missed test/presentation according to the negotiated schedule will result in a mark of zero.

Note: Certain forms of formal summative evaluations (exams, summative project presentations or tasks, etc.) are time sensitive. This means they must be completed at and within a specific time. Students must be present and prepared for these summative evaluations. Any absence will result in a mark of **zero**, unless validated by an official certificate. (ex. Medical Certificate).

2. If an assignment is late or incomplete, a student will be provided with a second opportunity. Students who are provided with a second opportunity, **shall complete the required assignment within five school days**. If no evidence is forthcoming after five days, a mark of zero will be assigned.
3. Copied, borrowed or stolen work provides no evidence of learning. Teacher will document and archive the work in question. Students may be allowed to resubmit the assignment. The teacher and administrator will define the parameters for the completion of this task.

General Course Information

Students must bring the following materials to each class:

- textbook
- separate Math binder (to hold notes, tests, quizzes, handouts)
- pencil case (to hold pencils, erasers, ruler, coloured pens)
- scientific calculator
- lined and graph papers

The text used for this course is **Calculus & Vectors** (Nelson, \$90.45). *The student is responsible for the cost of replacement or repairs, if the text is lost, or damaged.*

Graphing Calculators

Calculators with graphing technology are permitted for most evaluations, and are of great assistance for homework. Students without a handheld model can access online versions at home or through a smartphone.
