



Grade 12 Calculus and Vectors Online

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 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.

Overall Expectations

By the end of this course, students will:

- 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;
- 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;
- 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.

Unit Breakdown

Calculus and Vectors is broken down into the following units:

Unit	Title
1	Rates of Change
2	Derivatives
3	Applications of Derivatives
4	Exponential, Logarithmic and Trigonometric Functions
5	Vectors
6	Applications of Vectors
7	Equations of Lines and Planes
8	Relationships between Points, Lines and Planes

Mark Breakdown

The overall course is broken into Term Work and the Final Exam:

Section Percentage

Term Work 70%

Final Exam 30%

Both the Term work and the Final Exam are broken into the following skill categories:



Section Percentage

Quizzes 6.00%

Tests

For additional resources, the recommended textbooks are:

Calculus and Vectors 12, McGraw-Hill Ryerson, 2008.

Calculus and Vectors, Nelson Education Ltd., 2009.