

# OSSD - Calculus and Vector

MCV4U

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**Unit 1: Limits and the Derivative.** The transition from average to instantaneous rates of change. Introduction to the limit operator, continuity, and the formal definition of the derivative from first principles.

**Unit 2: Rules of Differentiation.** Development of the algebraic machinery for differentiation. The Power, Product, Quotient, and Chain rules are applied to polynomials and rational functions to bypass the limit definition.

**Unit 3: Derivatives of Transcendental Functions.** Extension of differential calculus to non-algebraic functions. Analysis of the derivatives of sinusoidal, exponential, and logarithmic functions, including applications to composite functions.

**Unit 4: Applications of Derivatives.** Utilization of the derivative to solve real-world problems. Topics include velocity and acceleration in kinematics, related rates of change, and mathematical optimization problems.

**Unit 5: Curve Sketching.** A systematic approach to analyzing function behavior. Using the first and second derivatives to determine intervals of increase/decrease, concavity, points of inflection, and asymptotic behavior.

**Unit 6: Introduction to Vectors.** The shift from scalar to vector quantities. Geometric and algebraic representations of vectors in  $\mathbb{R}^2$  and  $\mathbb{R}^3$ , including operations such as vector addition, scalar multiplication, and the dot and cross products.

**Unit 7: Lines and Planes in  $\mathbb{R}^3$ .** Analytic geometry in three-dimensional space. Derivation of vector, parametric, and Cartesian equations for lines and planes, and the analysis of their intersections and distances.

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# 1 Coutunity

## 1.1 Rate of Change

**Theorem 1.1.** *When we met our friends*

In reality, this is wrong!