

## Calculus Overview

**Course Description:** In Calculus, the student brings together all the skills learned in Algebra through Precalculus and applies them to the study of limits. Students will find themselves in a course traditionally taken by first and second semester college students. During the first semester, the student will engage in a complete analysis of limits of ratios (derivatives). During the second semester the student will perform the same analysis on limits of sums (integrals).

*\*Dual credit through UMSL is offered in this course. Dual credit is not recommended for 9th graders.*

**Grade Level:** 11-12th

### Curricular Work Thus Far:

1. Solicited feedback from district and community stakeholders to guide course development.
2. Examined state standards ([Missouri Learning Standards](#)) and national standards ([Common Core State Standards](#)) to inform course development.
3. Developed a curricular scope & sequence of eight units within the yearlong course.

**Unit 1:** Limits and Continuity

**Unit 2:** Derivatives

**Unit 3:** Derivatives of Functions

**Unit 4:** Applications of Derivatives to Graphing

**Unit 5:** Further Applications of Derivatives

**Unit 6:** Antiderivatives

**Unit 7:** The Definite Integral

**Unit 8:** Area, Volume, and Net Change

4. Developed unit essential questions and student learning goals in alignment with state standards. Examples include, but are not limited to:

### Essential Questions:

- How do you use the definition and the properties of limits to evaluate finite, infinite, and one-sided limits?
- How do you use the definition of a continuous function to recognize and graph continuous and discontinuous functions?
- How do you find derivatives of algebraic and trigonometric functions by using differentiation rules, the product and quotient rules, the chain rule, and implicit differentiation?
- How do you apply the first and second derivative tests to curve sketching and use real data to develop and solve models of real world applications involving

related rates, optimization and differentials, making estimates, predictions, and making informed estimates?

- How do you find antiderivatives, compute definite integrals, and apply several integration techniques including integration by substitution?
- How do you use the definite integral to calculate areas and volumes?

**Student Learning Goals:**

- Students will justify reasoning by applying the Intermediate Value of Theorem (IVT).
- Students will find the derivative of a function by applying the Definition of the Derivative.
- Students will use the rules of differentiation to calculate derivatives for the six basic trigonometric functions.
- Students will apply the Extreme Value Theorem (EVT).
- Students will use derivatives through L'Hopital's Rule to evaluate limits.
- Students will simplify functions to take an antiderivative.
- Students will evaluate a definite integral using the First Fundamental Theorem of Calculus.
- Students will determine the average value of a function.