

# Calculus

**Instructor:**

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Room 207

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This course is designed to give students approximately one semester of college Calculus. An understanding of limits, trigonometry and functions is necessary. An in-depth study of limits, derivatives, integrals and the applications of each will be the focus of the course. The course may be taken for dual credit (high school and college credit) through USM's ASPIRE program. USM credit requires a \$75 USM fee. 1 HHS credit, 4 credit hours – USM.

**Graduation Standards** (the number of the standard is referenced in the performance indicators listed in each unit):

1-Number & Quantity: Reason and model quantitatively, using units and number systems to solve problems.

3-Functions: Interpret, analyze, construct, and solve linear, quadratic, and trigonometric functions.

## Unit 1 Precalculus Review & Limits

**Summary** In this unit students will review the concepts of precalculus which are most important to early success in calculus. Topics will include linear and nonlinear functions, their graphs, roots, and important features. Concepts of limits will be covered in detail as limits are what distinguish calculus from algebra. Students will understand the concept of a limit, be able to find limits through graphical, numerical, and algebraic techniques and explain why some limits do not exist. Limits will be used to determine continuity.

**Performance Indicators** 1F. Compute within the real number system.

3C. Analyze functions using different representations.

**Assessed in Unit** 3K. Understand limits and apply to determining continuity of a function

## Unit 2 Derivatives

**Summary** Concepts of derivatives will be covered in detail. The unit begins with using the definition of a derivative to find instantaneous rates of change. This is followed with a discussion of what it means for a function to be differentiable. Students then learn rules for differentiation and go one to find velocity and other rates of change. Derivatives of trigonometric, logarithmic, exponential and inverse trigonometric functions are learned and applied. Students learn to take derivatives of composite functions through the use of the chain rule and implicit functions through implicit differentiation.

**Performance Indicators** 1F. Compute within the real number system.

3L. Find derivatives of functions and apply in problem solving.

**Assessed in Unit**

## Unit 3 Applications of Derivatives

**Summary** Once all derivative techniques have been learned, students begin using the derivative to determine extrema, concavity, and to graph functions. Students learn and apply the Mean Value Theorem. Modeling and optimization are emphasized as students solve min/max problems and related rate problems.

**Performance Indicators** 1F. Compute within the real number system.

3L. Find derivatives of functions and apply in problem solving.

**Assessed**

in Unit

#### **Unit 4 Integrals**

**Summary** We begin our study of 'accumulation' through estimating with finite sums and define the definite integral as a lim of Riemann sums. We extend our knowledge of integration to antiderivatives and use the Fundamental Theorem of Calculus to connect derivatives with integrals. When given numerical data, we use trapezoidal approximations to find accurate estimates of integrals. We will explore methods of rebuilding from derivative to original functions by using slope fields and Euler's method. We perform algebraic integrations using substitution.

**Performance** 1F. Compute within the real number system.  
**Indicators** 3D. Build a function that models a relationship between two quantities.  
**Assessed** 3M. Find integrals of functions and apply in problem solving.  
in Unit

#### **Unit 4 Integrals & Applications**

**Summary** We look at specific applications of the derivative/integral relationship in exponential growth and decay, and logistic growth. Finally, we use integration to accumulate volumes of rotation and volumes of solids with known cross sections.

**Performance** 1F. Compute within the real number system.  
**Indicators** 3D. Build a function that models a relationship between two quantities.  
**Assessed** 3M. Find integrals of functions and apply in problem solving.  
in Unit

### **Summative Assessments Retake**

- Students have the opportunity to retake summative assessments.
- The student must submit a retake form to the teacher within five (5) school days of the date that the summative assessment score is reported to the student.
- The highest score a student can receive on a retake or late assessment is a 75.
- The score achieved on a retake will replace the current score (even if the score is lower).
- If a student is making up a test from an absence, that assessment will be graded up to 100.

### **Grading of Formative Assessments**

- Formative assessments will count as 20% of the grade.
- Formative assessments may be scored on either a 0-100 scale or a 0-4 scale.
- The 0-4 scale will be represented in Power School as 4=100, 3=87, 2=77, and 1=67.
- The method of scoring of formative assessments will be determined by assignment.