

**MISSOURI WESTERN STATE UNIVERSITY**

**COLLEGE OF LIBERAL ARTS AND SCIENCES**

**DEPARTMENT OF COMPUTER SCIENCE, MATHEMATICS, AND PHYSICS**

***COURSE NUMBER:*** MAT 165

***COURSE NAME:*** Calculus with Analytic Geometry I: Differentiation

***COURSE DESCRIPTION:***

Includes the study of limits and continuity of real functions, the derivative of algebraic and trigonometric functions, and applications of the derivative.

***PREREQUISITE:***

ACT math score of 25 or higher, or a grade of C or better in MAT 116 and a grade of C or better in MAT 119 or concurrent enrollment in MAT 119. (Not open to the student with credit in MAT 167.)

***TEXT:***

*Calculus w/Access(Looseleaf)*, Larson, Hostetler, Edwards; Edition 10<sup>th</sup> 14, Cengage L, ISBN 9781305718661

***TECHNOLOGY:***

Use of a graphing calculator having at least the capabilities of the TI-83 will be required for the student throughout the course.

***COURSE OBJECTIVES:***

This course is intended to satisfy the general studies mathematics requirement for a baccalaureate degree. It is also designed to serve as a prerequisite for future study in mathematics and science. The main goal of this course is to develop students' conceptual understanding of limit, continuity, and derivative, while enhancing their proficiency in computing the derivative of algebraic and trigonometric functions. In order to meet this goal, students will learn how to:

1. Compute limits of algebraic and trigonometric functions.
2. Utilize the definition of derivative to derive or prove mathematical statements.

3. Find derivatives of algebraic and trigonometric functions.
4. Identify and use interpretations of the derivative to solve problems related to curve sketching, related rates, and optimization.
5. Utilize mathematical language and symbolism to communicate ideas and represent relationships.
6. Interact verbally with others to clarify and extend understanding of mathematical situations.

***COURSE OUTLINE:***

- I. Limits and Their Properties
  - A. Introduction to Limits
  - B. Properties of Limits
  - C. Techniques for Evaluating Limits
  - D. Continuity and One-Sided Limits
  - E. Infinite Limits
- II. Differentiation
  - A. The Derivative and the Tangent Line Problem
  - B. Basic Differentiation Rules and Rates of Change
  - C. The Product and Quotient Rules and Higher-Order Derivatives
  - D. The Chain Rule
  - E. Implicit Differentiation
  - F. Related Rates
- III. Applications of Differentiation
  - A. Extrema on an Interval
  - B. Rolle's Theorem and the Mean Value Theorem
  - C. Increasing and Decreasing Functions and the First Derivative Test
  - D. Concavity and the Second Derivative
  - E. Limits at Infinity
  - F. A Summary of Curve Sketching
  - G. Optimization Problems

***GENERAL EDUCATION GOALS AND COMPETENCIES:***

As noted above, this course is intended to satisfy the general studies mathematics requirement for a baccalaureate degree. Upon successful completion of this course, the following state-level goals and competencies will have been met:

## I. Skills Areas

### a. Communicating

Students will demonstrate the ability to...

6. Use mathematical and statistical models, standard quantitative symbols and various graphical tactics to present information with clarity, accuracy and precision.

### b. Higher-Order Thinking

Students will demonstrate the ability to...

1. Recognize the problematic elements of presentations of information and argument and to formulate diagnostic questions for resolving issues and solving problems.
2. Use linguistic, mathematical or other symbolic approaches to describe problems, identify alternative solutions, and make reasoned choices among those solutions.
3. Analyze and synthesize information from a variety of sources and apply the results to resolving complex situations and problems.
4. Defend conclusions using relevant evidence and reasoned arguments.
5. Reflect on and evaluate their critical-thinking processes.

## II. Knowledge Areas

### c. Mathematics

Students will demonstrate the ability to...

1. Describe contributions to society from the discipline of mathematics.
2. Recognize and use connections within mathematics and between mathematics and other disciplines.
3. Read, interpret, analyze and synthesize quantitative data (e.g., graphs, tables, statistics, survey data) and make reasoned estimates.
4. Formulate and use generalizations based upon pattern recognition.
5. Apply and use mathematical models (e.g., algebraic, geometric, statistical) to solve problems.