

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

MATHEMATICS 180 – ANALYTIC GEOMETRY AND CALCULUS I

5 hours lecture, 5 units

Catalog Description

Graphic, numeric and analytic approaches to the study of analytic geometry, limits and continuity of functions, and introductory differential and integral calculus. Applications involving analysis of algebraic, exponential, logarithmic, trigonometric and hyperbolic functions from a variety of disciplines including science, business and engineering. First of three courses designed to provide math, science, and engineering students with a solid introduction to the theory and techniques of analysis.

Prerequisite

“C” grade or higher or “Pass” in MATH 170 and 175, or MATH 176 or equivalent

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Algebra
 - a. Knowledge and understanding of domain and range
 - b. Solving equations involving polynomials, logarithms, exponents, absolute value, and/or radicals
 - c. Function composition
 - d. Thorough understanding of the properties of rational exponents
 - e. Properties of real numbers
- 2) Trigonometry
 - a. Identifies and formulas
 - b. Standard angles
 - c. Converting between radian and degree measure
 - d. Solving trigonometric equations
- 3) Geometry
 - a. Analytic geometry
 - b. Formulas for standard geometric objects
 - c. Properties of geometric figures
 - d. Similarity
- 4) Mathematical Reasoning
 - a. Recognize mathematical arguments
 - b. Modeling
- 5) Graphing
 - a. Functions and their inverses
 - b. Conic sections
 - c. Graph interpretation

Course Content

- 1) Definition and computation of limits using numerical, graphical, and algebraic approaches
- 2) Continuity and differentiability of functions
- 3) Derivative as a limit
- 4) Interpretation of the derivative as: slope of tangent line, a rate of change
- 5) Differentiation formulas: constants, power rule, product rule, quotient rule and chain rule

- 6) Derivatives of transcendental functions such as trigonometric, exponential or logarithmic
- 7) Implicit differentiation with applications, and differentiation of inverse functions
- 8) Higher-order derivatives
- 9) Graphing functions using first and second derivatives, concavity and asymptotes
- 10) Maximum and minimum values, and optimization
- 11) Mean Value Theorem
- 12) Antiderivatives and indefinite integrals
- 13) Area under a curve
- 14) Definite integral
- 15) Riemann sum
- 16) Properties of the integral
- 17) Fundamental Theorem of Calculus
- 18) Integration by substitution
- 19) Indeterminate forms and L'Hopital's Rule

Course Objectives

Students will be able to:

- 1) Compute the limit of a function at a real number;
- 2) determine if a function is continuous at a real number;
- 3) find the derivative of a function as a limit;
- 4) find the equation of a tangent line to a function;
- 5) compute derivatives using differentiation formulas;
- 6) use differentiation to solve applications such as related rate problems and optimization problems;
- 7) use implicit differentiation;
- 8) graph functions using methods of calculus;
- 9) evaluate a definite integral as a limit;
- 10) evaluate integrals using the Fundamental Theorem of Calculus; and
- 11) apply integration to find area.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Tests, examinations, homework or projects where students demonstrate their mastery of the learning objectives and their ability to devise, organize and present complete solutions to problems.

Special Materials Required of Student

Graphing utility, portfolio

Minimum Instructional Facilities

Smart classroom with whiteboards covering three walls, graphing utility overhead viewing panels, projection screen

Method of Instruction

- 1) Lecture and discussion
- 2) Teamwork

Out-of-Class Assignments

- 1) Problem sets
- 2) Exploratory activities and/or projects
- 3) Reading and/or writing assignments

Texts and References

- 1) Required (representative example): Stewart, James. *Calculus, Early Transcendentals*. 8th edition. Cengage, 2016.
- 2) Supplemental: None

Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

- 1) Essential vocabulary and concepts
 - a. Limits
 - b. Continuity
 - c. Differentiation
 - d. Integration
- 2) Evaluating limits: algebraic, trigonometric, logarithmic and exponential functions
- 3) Limit Calculations
 - a. Using L'Hopital's Rule
 - b. Solving limits with indeterminate forms
- 4) Evaluating derivatives
 - a. Implicitly
 - b. Algebraic, trigonometric, logarithmic and exponential functions
- 5) Evaluating integrals: algebraic, trigonometric, logarithmic and exponential functions
- 6) Applying the Fundamental Theorem of Calculus.
- 7) Graphing: interpreting function behavior from derivatives
- 8) Modeling and applications
 - a. Related rates
 - b. Relative extrema
 - c. Area between curves

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Use analytical, numerical, and graphical methods to solve calculus problems.
- 2) Solve multi-disciplinary application problems and interpret the results in context.

*For the complete list of **learning objectives**, please see the **Course Objectives** section