C-ID Descriptor
Single Variable Calculus Sequence

Descriptor Details

- **Descriptor Title**: Single Variable Calculus Sequence
- **C-ID Number**: 900
- **Suffix**:
  - Sequence (S)
- **Units**: 8.0
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General Description

Differential and integral calculus of a single variable: functions; limits and continuity; techniques and applications of differentiation and integration; Fundamental Theorem of Calculus; integration; techniques of integration; infinite sequences and series; polar and parametric equations; applications of integration.
Primarily for Science, Technology, Engineering & Math Majors.

Prerequisites

Precalculus, or college algebra and trigonometry, or equivalent.

Corequisites

No information provided

Advisories

No information provided

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; Riemann sum;
15. Properties of the integral;
16. Fundamental Theorem of Calculus;
17. Integration by substitution;
18. Derivatives and integrals of inverse functions and transcendental functions such as trigonometric, exponential or logarithmic;
19. Indeterminate forms and L'Hopital's Rule;
20. Additional techniques of integration including integration by parts and trigonometric substitution;
21. Numerical integration; trapezoidal and Simpson's rule;
22. Improper integrals;
23. Applications of integration to areas and volumes;
24. Additional applications such as work, arc length, area of a surface of revolution, moments and centers of mass, separable differential equations, growth and decay;
25. Introduction to sequences and series;
26. Multiple tests for convergence of sequences and series;
27. Power series, radius of convergence, interval of convergence; and
28. Differentiation and integration of power series.

Lab Activities

No information provided

Objectives

Upon successful completion of the course, 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;
11. Apply integration to find area;
12. Evaluate definite and indefinite integrals using a variety of integration formulas and techniques;
13. Apply integration to areas and volumes, and other applications such as work or length of a curve;
14. Evaluate improper integrals;
15. Apply convergence tests to sequences and series;
16. Represent functions as power series; and
17. Graph, differentiate and integrate functions in polar and parametric form.

Evaluation Methods

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.

Textbooks

A college level textbook designed for science, technology, engineering and math majors, and supporting the learning objectives of this course.