

CALCULUS

Course Description

This course reviews some concepts from Precalculus. It applies the concept of limit in formulating the idea of a derivative and an integral. Calculus investigates the use of differentiation and integration in problem solving.

Student Outcomes

After completion of this course, the student will be able to:

1. Recall concepts from precalculus.
2. Identify functions and the cartesian plane, and then solve related problems.
3. Apply the concepts of a limit to physical and mathematical problems.
4. Identify the rules of differentiation and show how to differentiate functions.
5. Relate the methods of differentiation to solving problems.
6. Compare differentiation to integration.
7. Evaluate a definite and an indefinite integral.
8. Recall logarithmic and exponential functions and apply the rules for differentiation and integration to these functions.
9. Apply the rules of integration to solving problems.
10. Identify different integration techniques and apply them in evaluating definite and indefinite integrals.
11. Select and compare data from a table, graph, or diagram.
12. Identify a direct or inverse relationship between variables in a table, graph, or diagram.
13. Extrapolate from data points in a table or graph.
14. Identify or use a mathematical relationship that exists between data.
15. Condense and paraphrase material from assigned textbooks.
16. Determine significance and omit unnecessary material from notes.

UNIT 1: PREREQUISITES-THE CARTISIAN PLANE AND FUNCTIONS

Student Outcomes: After completion of this unit the student will:

1. Define and solve problems involving real numbers, inequalities, absolute value and distance.
2. Recall formulas involving distance, midpoint and circles.
3. Define linear equations by graphing.
4. Apply formulas to find equations of lines.
5. Recognize functions, specifically trigonometric functions.

UNIT 2: LIMITS AND THEIR PROPERTIES

Student Outcomes: After completion of this unit the student will:

1. Apply properties of limits to find limits of functions.
2. Use algebraic techniques to find limits of functions.
3. Discuss continuity and one-sided limits.
4. Solve problems with infinite limits.

UNIT 3: DIFFERENTIATION

Student Outcomes: After completion of this unit the student will:

1. Show how to find derivatives by using the limit process.
2. Apply basic differentiation rules to find derivatives.
3. Recognize the relationship of the derivative to the slope of a curve at a point.
4. Evaluate derivatives using product and quotient rules.
5. Use the chain rule to find derivatives.
6. Find the equation of the tangent line at a point on a curve.
7. Differentiate implicitly.
8. Solve problems with related rates using differentiation.

UNIT 4: APPLICATIONS OF DERIVATIVES

Student Outcomes: After completion of this unit the student will:

1. Apply the use of derivatives to find the extrema of a function.
2. Work problems demonstrating the Mean-Value Theorem and Roll's Theorem.
3. Use derivatives to determine where a function is increasing and decreasing.
4. Use the second-derivative to find points of inflection.
5. Evaluate limits on an infinite interval.
6. Graph functions using asymptotes.
7. Analyze and sketch graphs of functions.
8. Apply the concept of maximum and minimum to solve business and economic problems.
9. Calculate differentials.

UNIT 5: INTEGRATION

Student Outcomes: After completion of this unit the student will:

1. Apply basic integration rules to find an antiderivative.
2. Evaluate a sum using sigma notation.
3. Use the limit process to find area of a region under a curve.
4. Evaluate the definite integral.
5. Evaluate integrals using substitution.

UNIT 6: LOGARITHMIC, EXPONENTIAL AND OTHER TRANSCENDENTAL FUNCTIONS.

Student Outcomes: After completion of this unit the student will:

1. Recall properties of natural logarithms and find the derivative of natural logarithms.
2. Integrate natural logarithms.
3. Integrate trigonometric functions.
4. Recall the process of finding and inverse of a function and evaluate derivatives of these functions.
5. Find the derivative of exponential functions.
6. Evaluate the integral of an exponential function.
7. Solve problems using applications of exponential functions.
8. Solve differential equations involving growth and decay problems.
9. Recall definitions of inverse trigonometric functions, and find the derivative of inverse trigonometric functions.

10. Integrate inverse trigonometric functions.
11. Integrate functions using the method of completing the square.
12. Evaluate hyperbolic functions and find the derivative of these functions.
13. Integrate hyperbolic functions.
14. Differentiate and integrate inverse hyperbolic functions.

UNIT 7: APPLICATIONS OF INTEGRATION

Student Outcomes: After completion of this unit the student will:

1. Use integration to evaluate the area between two curves.
2. Find the volume of 3-dimensional solids using integration.
3. Find the volume of cylindrical shells.
4. Find arc length and area of a surface of revolution.
5. Solve problems involving work done by a force, using integration.
6. Calculate fluid force using integration.

UNIT 8: INTEGRATION TECHNIQUES, L'HOPITAL'S RULE, AND IMPROPER INTEGRALS

Student Outcomes: After completion of this unit the student will:

1. Integrate using basic integration rules.
2. Evaluate an integral by using integration by parts.
3. Integrate trigonometric integrals.
4. Integrate using trigonometric substitution.
5. Integrate using the method of partial fractions.
6. Integrate using the table of integrals.
7. Evaluate limits of indeterminate form by using L'Hopital's Rule.
8. Solve improper integrals.

Course Assessments

The following will be used to assess the student's successful completion of this course:

1. Daily notes and homework compiled in a notebook.
2. Quiz scores.
3. Unit test scores.
4. Final Semester Exam.
5. A paper which uses computer research discussing the contributions of a mathematician.

Course Material

The textbook used for the completion of this course is Calculus of a Single Variable. The authors are Roland E. Larson, Robert p. Hostetler, and Bruce H. Edwards. Publisher is D. C. Heath and Company, Lexington, Massachusetts