Math 2138: Quantitative Business Analysis II

Credit hours: **3 credit hours**
Prerequisites: **Math 2077 with a grade of C or better**

Course Description

Differential and integral calculus are developed with special emphasis on practical applications to business and economics.

Course Objectives

1. Provide a mathematical foundation in differential and integral calculus for students in a variety of majors
2. Analyze problems from a graphical, algebraic, and numerical perspective
3. Solve application problems using derivatives and integrals in the fields of business and economics

Learning Outcomes

1. Evaluate limits, including one-sided limits and limits at infinity
2. Determine continuity of a function
3. Find the derivative of a variety of functions using the limit definition of derivative
4. Compute derivatives using the power rule, product rule, quotient rule, and the chain rule applied to polynomials, rational, radical, exponential, and logarithmic functions
5. Calculate higher order derivatives
6. Use the derivative to investigate slope; rates of change; total, marginal and average cost; total, marginal and average revenue; marginal propensity to consume and save; and elasticity of demand
7. Utilize the first and second derivative to determine critical values, inflection points, relative and absolute extrema, increasing or decreasing intervals, concavity intervals, and graphs of functions
8. Find indefinite integrals using various rules
9. Apply the Fundamental Theorem of Calculus to calculate definite integrals
10. Employ differentials to solve application problems
11. Solve integration exercises with initial conditions
12. Compute area under a curve and between curves
13. Use integration to solve applications involving revenue, cost, profit, and consumer's and producer's surplus

Course Topics

I. LIMITS AND CONTINUITY
   A. Definition and basic properties of limits
   B. One-sided limits
   C. Limits involving infinity
   D. Definition of a continuous function
   E. Determination of points of discontinuity of a function

II. INTRODUCTION TO THE DERIVATIVE
   A. Definition of the derivative
   B. Using the definition to find the derivative of a function
   C. Derivative as a slope
   D. Derivative as a rate of change

III. DIFFERENTIATION FORMULAS

A. Power function rule
B. Sum and difference rules
C. Product and quotient rules
D. Chain rule
E. Power rule
F. Implicit differentiation*

IV. DERIVATIVES OF SPECIAL FUNCTIONS
A. Exponential function
B. Logarithmic function

V. HIGHER ORDER DERIVATIVES
A. Notation
B. Computation

VI. CURVE SKETCHING WITH FIRST AND SECOND DERIVATIVES
A. Increasing and decreasing functions
B. Relative extrema using first derivative test
C. Relative extrema using second derivative test
D. Absolute extrema
E. Concavity and points of inflection
F. Sketching graphs

VII. BUSINESS APPLICATIONS OF THE DERIVATIVE
A. Marginal cost and marginal revenue
B. Marginal propensity to consume and save
C. Applied maxima and minima
1. Cost and revenue problems
2. Area problems
3. Volume problems*
D. Point elasticity of demand

VIII. INTRODUCTION TO INTEGRATION
A. Antiderivatives
B. Integral notation and terminology

IX. INTEGRATION FORMULAS
A. Power rule
B. Exponential rule
C. Logarithmic rule
D. Integration by parts*

X. THE DEFINITE INTEGRAL
A. Definition
B. Properties
C. Fundamental Theorem of Integral Calculus

XI. THE DEFINITE INTEGRAL AS AREA
A. Area under a curve
B. Area between curves

XII. APPLICATIONS OF INTEGRATION
A. Area as revenue, cost, profit
B. Consumers' and producers' surplus

C. Profit over time*

*Optional