Department:

Mathematics

Course Description:

This course provides an introduction to calculus and linear algebra concepts that are particularly useful in the study of economics and business administration. The course will cover the basic theorems and concepts of differential and integral calculus and linear algebra and will emphasize working problems with applications in economics and business.

Course Competencies:

Upon completion of the course, the student should be able to:

1. Define and explain what a function is and work with linear, power, polynomial, exponential, and natural logarithmic functions using words, tables, graphs, and formulas.
2. Solve problems by applying functions to business and economics.
3. Use the definition of a derivative to find the derivative at a point and of a function and interpret its meaning in general and in economic and business applications such as marginal cost and revenue.
4. Solve systems of linear equations using substitution, elimination, augmented matrix, row echelon form, and reduced row echelon form methods.
5. Use an algorithm to find an inverse of a matrix.
6. Use an inverse matrix to find the solution to a matrix equation.
7. Apply elementary techniques of linear algebra to solve multivariable business problems, including the open and closed Leontief models.
8. Find derivatives using various techniques, including power, product, quotient, chain, exponential, and logarithm rules.
9. Apply derivatives to problems, including finding maxima and minima, finding inflection points, and applying the first and second derivative tests.
10. Apply the derivative knowledge obtained in finding maxima and minima to solve business problems, including optimization of profit and revenue functions.
11. Find and apply average cost, elasticity of demand, and exponential and logistic growth.
12. Use left and right hand sums to estimate definite integrals from a table, graph, and formula.
13. Explain the integral as an area.
14. Find integrals using formulas.
15. Find the average value of a function.
16. Evaluate and analyze functions of two variables.
17. Compute first and second order partial derivatives.
18. Use the second derivative test to classify critical points.
19. Solve constrained optimization problems using various methods, including Lagrange multipliers.
Course Content:

A. Theory of Functions
   1. Linear Functions and Models
      a. Functions from the Numerical Viewpoint
      b. Functions from the Algebraic Viewpoint
      c. Functions from the Graphical Viewpoint
      d. Linear Functions
      e. Linear Models
      f. Linear Regression
   2. Business Functions
      a. Simple Interest
      b. Compound Interest
      c. Annuities, Loans, Bonds
   3. Nonlinear Models
      a. Quadratic Functions and Models
      b. Exponential Functions and Models
      c. Logarithmic Functions and Models
      d. Logistic Functions and Models

B. Linear Systems and Matrices
   1. Systems of Equations
      a. Systems of Two Equations and Two Unknowns
      b. Using Matrices to Solve Systems of Equations
      c. Applications of Systems of Equations
   2. Matrix Algebra and Applications
      a. Matrix Inversion
      b. Input-Output Models

C. Derivatives
   1. Introduction to the Derivative
      a. Average Rate of Change
      b. Derivative from the Numerical and Graphical Viewpoint
      c. Derivative from the Algebraic Viewpoint
   2. Techniques of Differentiation
      a. Derivative of Powers, Sums, and Constant Multiples
      b. Derivatives of Products and Quotients
      c. Derivative of Compositions (The Chain Rule)
      d. Derivatives of Logarithmic and Exponential Functions
   3. Applications of the Derivative
      a. Marginal Analysis
      b. First and Second Derivative Test
      c. Finding Maxima and Minima
      d. Applications of Maxima and Minima
      e. Analyzing Graphs

D. Integrals
MAT107 General Calculus and Linear Algebra
Prerequisite: MAT 104
3 Credit Hours (Lecture)

1. Indefinite Integral
2. Definite Integral
3. Average Value
E. Functions of Several Variables
   1. Functions of Several Variables from the Numerical and Algebraic Viewpoints
   2. Partial Derivatives
   3. Maxima and Minima of Multi-Variable Functions
   4. Constrained Maxima and Minima and Applications

Learning Assessments:

Course competencies will be assessed by written examinations covering all course material, including regular hour-long exams and a required, comprehensive final exam. Assessment may also include homework assignments, in-class work, quizzes, and projects.

Instructional Materials:


Guidelines for Requesting Accommodations Based on Documented Disability or Medical Condition

It is the intention of Highland Community College to work toward full compliance with the Americans with Disabilities Act, to make instructional programs accessible to all people, and to provide reasonable accommodations according to the law.

Students should understand that it is their responsibility to self-identify their need(s) for accommodation and that they must provide current, comprehensive diagnosis of a specific disability or medical condition from a qualified professional in order to receive services. Documentation must include specific recommendations for accommodation(s). Documentation should be provided in a timely manner prior to or early in the semester so that the requested accommodation can be considered and, if warranted, arranged.

In order to begin the process all students must complete the “Disabilities Self-Identification Form” at this link: https://highlandcc.edu/pages/disability-services.

This form can also be accessed at the Highland Community College homepage under Students Services/Student Resources/Disability Service or by contacting the Disabilities Coordinator.