

# **Math 2077: Quantitative Business Analysis I**

**Credit hours:**    **3 credit hours**

**Prerequisites:**    **Placement in ACCUPLACER Grid 5 or MATH 1200 with a grade of C or better**

## **Course Description**

The purpose of this course is to develop the quantitative methods needed to solve various problems in business and economics. Topics include functions and graphs, systems of linear equations, linear programming, matrices and determinants, logarithmic and exponential functions, and the mathematics of finance.

## **Course Objectives**

1. Provide a mathematical foundation to be able to solve applied problems in business and economics
2. Employ methods for solving systems of linear and nonlinear equations
3. Demonstrate understanding of concepts relating to interest and annuities

## **Learning Outcomes**

1. Evaluate, combine, compose, decompose, determine the domain and range for, and graph linear, quadratic, rational, square root, absolute value, piecewise, exponential and logarithmic functions
2. Identify symmetry, translations, and transformations of functions
3. Find the slope-intercept and standard form equations of non-vertical and vertical lines
4. Calculate the slope and determine the intercepts of non-vertical and vertical lines
5. Graph non-vertical and vertical lines
6. Find the intercepts and vertex for quadratic functions
7. Graph parabolas
8. Solve systems of linear equations in two and three variables (including determinate methods)
9. Solve systems of non-linear systems of equations in two variables (including substitution)
10. Solve linear programming problems
11. Solve exponential and logarithmic equations
12. Solve exercises involving compound interest, present and future value, equations of value, and annuities.
13. Perform addition, scalar multiplication, and multiplication operations on matrices
14. Compute the inverse of a matrix and solve matrix equations
15. Solve application problems relating to supply and demand, equilibrium, and break-even analysis

## **Course Topics**

- I. FUNCTIONS AND GRAPHS
  - A. Definition and examples
  - B. Domain and range
  - C. Combinations of functions
  - D. Composition/decomposition of functions
  - E. Graphing of functions
- II. LINEAR FUNCTIONS
  - A. Definition
  - B. Graphs
  - C. Equations of lines
    1. Slope-intercept problems
    2. Two-point problems

D. Applications to economics and business

### III. QUADRATIC FUNCTIONS

A. Definition

B. Graph of  $y = ax^2 + bx + c$

1. x-intercepts

2. y-intercept

3. Vertex

### IV. SYSTEMS OF EQUATIONS

A. Methods of solving linear equations

1. Substitution

2. Elimination by addition

B. Solving nonlinear systems of equations

C. Applications

1. Supply and demand analysis

a. Writing supply and demand equations

b. Finding equilibrium position for the market

2. Break-even analysis

### V. MATRICES

A. Definition

B. Operations with matrices

1. Addition and scalar multiplication

2. Matrix multiplication

C. Special types of matrices

1. Diagonal matrices

2. Identity matrix

3. Zero matrix

D. Matrix reduction\*

1. Elementary row operations

2. Properties of a reduced matrix

E. A method of determining the inverse of a matrix

F. Matrix solutions to systems of equations

### VI. DETERMINANTS

A. Definition

B. Properties

C. Cramer's rule

### VII. LINEAR PROGRAMMING

A. Definition of constraints and objective function

B. Methods of solution

1. Graphical method of solution

a. Graphing the feasible solution area

b. Substituting corner points of the feasible solution area into the objective function

2. Simplex method\*

### VIII. EXPONENTIAL AND LOGARITHMIC FUNCTIONS

A. Laws of exponents

B. Exponential functions

1. Definition

2. Graphs

C. Logarithmic functions

1. Definition
  2. Common and natural logarithms
  3. Graphs
  4. Properties of logarithms
- D. Relationship between exponential and logarithmic functions
- E. Solving logarithmic and exponential equations

**IX. MATHEMATICS OF FINANCE**

- A. Compound interest
  1. Amount
  2. Effective rate of interest
  3. Present value
- B. Annuities
  1. Ordinary annuity
    - a. Present value
    - b. Future value
  2. Annuity due
    - a. Present value
    - b. Future value
  3. Sinking fund
  4. Amortization
  5. Complex annuities\*

\*Optional