

MATH 24 : MODERN BUSINESS MATHEMATICS

California State University, Sacramento · Department of Mathematics & Statistics

This is a course designed around applications of mathematics in economic and business contexts. Students analyze realistic business-related problems and will learn the mathematics necessary to solve those problems. The course will proceed using case studies, real data sets, and business-related problems, all of which will be generated and developed jointly by faculty from the College of Business Administration and the Department of Mathematics and Statistics. The focus will be on investigations and mathematics that are current and relevant. Applications will be demonstrated by the use of spreadsheets to simulate different scenarios. The mathematics falls into four general areas: function, finance, rates of change, and linear programming. Students will be given periodic writing assignments that encourage them to think through course concepts.

CATALOG DESCRIPTION

Mathematics for business world, including functions, math of finance, and rates of change. Applications to economics and business will be emphasized throughout the course. **Graded:** Graded Student. **Units:** 4.0.

PREREQUISITES

Math 9 or three years of high school mathematics which includes two years of algebra and one year of geometry; completion of the ELM requirement and a passing score on the Intermediate Algebra Diagnostic (IAD) test.

LEARNING OBJECTIVES

- Know the algebraic definitions and graphs of linear and quadratic functions, power and general polynomial functions, and exponential and logarithmic functions.
- Understand simple and compound interest and apply to these concepts to the solution of problems involving annuities, loan amortization, and sinking funds.
- Learn the basic principles of linear programming and find the graphical solution to 3×3 linear programming problems involving production scheduling and asset allocation.
- Understand the definition of the derivative, interpret the definition geometrically and in terms of the rate of change of a function, and apply the derivative in a variety of applied contexts including marginal cost, revenue, profit, and optimization.

AREA B-4 MATHEMATICAL CONCEPTS AND QUANTITATIVE REASONING STUDENT LEARNING OUTCOMES

Students will be able to:

1. Solve problems by thinking logically, making conjectures, and constructing valid mathematical arguments.
2. Make valid inferences from numerical, graphical and symbolic information.
3. Apply mathematical reasoning to both abstract and applied problems, and to both scientific and non-scientific problems.

TEXT

Math for Managerial Life and Social Science 7/e, by Tan

COVERAGE

Chapters 1-4, 6, 9 and 10.

WRITING COMPONENT

This is an area B4 GE course and has a writing component. To satisfy the writing requirement graded assignments involving writing and understanding of complex technical prose, interpretation of theoretical ideas, and the use of mathematical ideas will be part of the course.

ASSIGNMENTS

A variety of reading and problem solving assignments will be part of the course.

EXAMINATIONS

There will be regular midterm examinations and a comprehensive final examination for this course.

COURSE OUTLINE

I. Functions (4 weeks)

- A. Examples of formulas, tables and graphs (e.g., cost, revenue, and profit functions, depreciation functions, budget constraints)
 - 1. Discrete and continuous
 - 2. Increasing and decreasing
- B. Proportionality and linear functions
- C. Quadratic functions, power functions, and polynomials
- D. Exponential and logarithmic functions
- E. Combining functions
 - 1. Sums and differences
 - 2. Products

II. Finance (3 weeks)

- A. Compound interest
 - 1. Finite geometric series
 - 2. Exponential functions and limits (continuous compounding)
- B. Present and future value
- C. Exponential models in economics
 - 1. Polynomial growth
 - 2. Exponential growth
- D. $P \left(1 + \frac{r}{n}\right)^{nt}$ and Pe^{rt} - dependence on P, t, r

III. Rates of Change (4 weeks)

- A. Average rate of change
 - B. Marginal cost from a discrete point of view
 - C. Evaluating rates of change for a variety of elementary functions
 - 1. Graphical interpretation and evaluation
 - 2. Numerical evaluation
 - 3. Algebraic evaluation
 - D. Rates of change for more complicated functions
 - 1. Sums and differences
 - 2. Products and quotients
 - 3. Power rule
 - 4. Exponential and logarithmic functions
 - E. Applications
 - 1. Marginal analysis
 - 2. Elasticity of demand
 - F. Optimization
 - 1. Extreme points and points of inflection
 - 2. Profit maximization
 - 3. Cost minimization (inventory)
 - 4. Revenue maximization
 - 5. Break even
- IV. Linear Programming (3 to 4 weeks)
- A. Examples of LP problems (product mix, allocation)
 - B. Necessity of LP
 - C. Geometrical or graphical solution of LP problems
 - 1. Graphic linear equations and inequalities
 - 2. Graphing the region of feasibility
 - 3. Finding corner points and solving the LP problem

EXAMPLES OF COURSE INVESTIGATIONS

- Which is better, an account that pays 8% interest guaranteed, or one that pays 12% half of the time and 4% the other half of the time?
- Suppose that your salary changes during a year and thus the amount withheld from your paychecks. Why does this result in the correct amount or too much being withheld, but not an insufficient amount withheld?
- Compare after-tax saving, tax-sheltered saving, and matched saving.