What Distinguishes This Text from Others

1) It employs universal design principles in how information is presented. Some examples of this are: simplicity and consistent use of common notation, careful explanation of mathematical 'jargon', vertical rather than horizontal arrangements of visual or tabular information, and avoidance of symbols with multiple meanings.
2) Develop marketable skills applicable in a business environment – whether it be a company or organization comprising of one individual, 50 individuals, or a thousand. Many of the lessons include applicable spreadsheet activities that enable the student to visualize the mathematical principles which help to answer meaningful questions.
3) With practice, the student will develop confidence toward being able to communicate accurately using mathematical models, formulas, and data tools. Instead of emphasizing procedures, the emphasis is on extrapolation, interpretation, analysis, and critical thinking.
4) With the emergence of large language models and intelligent systems, the need for computation and algebraic manipulation will be less relevant. Tools like Mathway, Cymath, and Desmos are constantly improving as the training data and prompt engineering improves. Given that these automations are still developing and still are prone to errors, it will be more necessary than ever before to be able to assess and evaluate information that is presented, determine its reliability, and finally to assess its application (when, how, and to whom).
5) The inclusion of a Chapter Zero offers the student more than just elementary mathematical concepts. These foundational concepts are put in context which enriches and broadens the learner's perspective. Numbers are not just objects to be plugged into a formula. They actually mean something contextually. A fraction isn't just a fraction, but a means to engage in commerce or calculate the frequency of a leap year. In a typical semester course, Chapter Zero is not included in the Syllabus. It is there for the student to review basic concepts as needed or desired.

Outline

Chapter 0: Foundations of Mathematical Reasoning and Expression

- Section 0.1 The Real Number System
  - Real, Rational and Integer Number Systems
  - Words We Use for Numbers
- Section 0.2 What's the Big Deal About Fractions?
  - Pieces of Eight
  - Unit Fractions and Other Notation
  - Ratio as a Fraction
  - Leap Year Calculations
- Section 0.3 From Fractions and Decimals to Percents
  - What the % Symbol Means
  - Some Applications of Percent
- Section 0.4 How Big or Small; High or Low; Near or Far
  - Measurement and Size
  - Context Used to Interpret Scale of Something
  - Definition of Magnitude and Distance
- Section 0.5 Direction and the Rectangular Coordinate System
  - Coordinates on a Flat Surface
  - Distance and Direction
  - Quadrants in the Coordinate System

Chapter 1: Functions and Linear Models

- Section 1.1 Definitions and Terminology of Functions
  - Continuous versus Discrete Sets of Numbers
  - Functions and Function Notation
  - Multiple Representations (graphical, tabular, description, formulaic)
- Section 1.2: Characteristics of Functions
  - Domain and Range
  - Predictor variable and Response variable
- Section 1.3: Rates of Change and Bivariate Behavior

- How two quantities correlate
- Analyzing average rate of change
- Patterns in relationships (Increasing/decreasing)

Section 1.4: Linear Models
- Definition of a Linear Function and Implications
- Characteristics of Linear Relationships

Section 1.5: Graphs of Linear Functions
- Extracting Meaning From a Graph
- Creating a Graph From Data or an Equation

Section 1.6: Interpreting With Linear Models
- Use Verbal Descriptions In Linear Relationships
- Applications
  - When Time is the Predictor Variable
  - When the Response is Cost, Revenue, or Profit
  - Supply and Demand

Section 1.7: Fitting a Linear Model From Data
- Choosing the Predictor and Response
- Why Domain Matters
- Interpolation and Extrapolation

Chapter 2: Input/Output Analysis (Matrices in Economic Systems)

Section 2.1: Matrix Representation
- System of Equations and Matrix Equivalent
- Using Technology to Solve a System
- Interpreting and Analyzing the Results

Section 2.2: A Problem in Industrial Production
- Connecting Verbal Descriptions To Equations
- Understand The Situation Using Multiple Representations

Section 2.3: A Problem in Conglomerate Production
- Connecting Verbal Descriptions To Equations
- Understand The Situation Using Multiple Representations

Chapter 3: Optimization With Multiple Variables (Linear Optimization – A Case Study)

Section 3.1: Description of a Problem
- Connecting Verbal Descriptions To Equations
- Understand The Situation Using Multiple Representations
- Naming the Function To Be Optimized

Section 3.2: Matrix Representations
- From System of Equations To Matrix

Section 3.3: Finding Solutions
- Using Software To Do the Dirty Work
- Meaning Behind the Numbers

Section 3.4: Interpretation and Analysis

Chapter 4: Polynomials As Models

- Section 4.1: Quadratic Models
  - Definition of a Quadratic Function and Implications
  - Characteristics of Quadratic Type Relationships
- Section 4.2: Graphs of Quadratic Functions
  - Extracting Meaning From a Graph
  - Creating a Graph From Data or an Equation
- Section 4.3: Interpreting With Quadratic Models
  - Use Verbal Descriptions In Quadratic Relationships
  - Applications
    - When time is the predictor variable
    - When the response is cost, revenue, or profit
- Section 4.4: Polynomial Models
  - Definition of a Polynomial Function and Implications
  - Characteristics of Polynomial Type Relationships

Chapter 5: Exponential and Logarithm As Models

- Section 5.1: Exponential Models
  - Definition of an Exponential Function and Implications
  - Characteristics of Exponential Relationships
  - Exponential Growth and Decay
- Section 5.2: Graphs of Exponential Functions
  - Extracting Meaning From a Graph
  - Creating a Graph From Data or an Equation
- Section 5.3: Logarithm Models
  - Definition of a Logarithm Function and Implications
  - Characteristics of Logarithmic Relationships
  - Logarithm in Population Growth Models
- Section 5.4: Graphs of Logarithm Functions
  - Extracting Meaning From a Graph
  - Creating a Graph From Data or an Equation
- Section 5.5: Applications of Exponential and Logarithm Models
  - Population Growth and Decay Case Studies
  - Compound Interest
  - Applying a Logarithmic Scale to Stock Market Data

Chapter 6: Finance

- Section 6.1: Simple and Compound Interest
- Section 6.2: Annuities
- Section 6.3: Payout Annuities

Intuitive development of the concept of a limit

Section 9.4: Average Rate of Change on an Interval

Example from the NYSE

Connection to the Derivative

Applications

Section 9.5: Marginal Cost and Revenue

Interpreting Meaning from Equations

Using the derivative in marginal cost/revenue situations

Section 9.6: More Applications of the Derivative

Cost, Revenue, and Profit

Decisions About “What Math to Use”

Possible Chapter 10

Intuitive Development of Area (Integration)

Probability Density Functions and Area as Probability of a Continuous Random Variable

More Applications of the Derivative in Optimization

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