

Berresford, FINITE, TOC

1. FUNCTIONS.

1.1 Real Numbers, Inequalities, and Lines.

Real Numbers and Inequalities. Sets and Intervals. The Cartesian Plane. Lines and Slopes. Equations of Lines. General Linear Equation.

1.2 Exponents.

Positive Integer Exponents. Properties of Exponents. Zero and Negative Exponents. Roots and Fractional Exponents. Fractional Exponents. Avoiding Pitfalls in Simplifying. Learning Curves in Airplane Production.

1.3 Functions.

Functions. Solving Quadratic Equations. Derivation of the Vertex Formula. Derivation of the Quadratic Formula.

1.4 More About Functions.

Polynomial Functions. Rational Functions. Piecewise Linear Functions. Composite Functions. Shifts of Graphs.

1.5 Exponential Functions.

Exponential Functions. Compound Interest. Depreciation by a Fixed Percentage. The Number e . Continuous Compounding of Interest. Intuitive Meaning of Continuous Compounding. The Function $y = ex$. Exponential Growth. Justification of the Formula for Continuous Compounding.

1.6 Logarithmic Functions.

Common Logarithms. Properties of Common Logarithms. Graphs of Logarithmic and Exponential Functions. Logarithms to Other Bases. Natural Logarithms. Carbon-14 Dating.

2. MATHEMATICS OF FINANCE.

2.1 Simple Interest.

Simple Interest Formula. Total Amount Due on a Loan. Discounted Loans and Effective Interest Rates.

2.2 Compound Interest.

Compound Interest Formula. Growth Times. Rule of 72. Effective Rates. Recap.

2.3 Annuities.

A First Example. Geometric Series. Accumulated Account Formula. Sinking Funds. How Long Will It Take?.

2.4 Amortization.

Present Value of an Annuity. Amortization. Unpaid Balance. Equity.

3. SYSTEMS OF EQUATIONS AND MATRICES.

3.1 Systems of Two Linear Equations in Two Variables.

Systems of Equations. Graphical Representations of Equations. Equivalent Systems of Equations. Elimination Method.

3.2 Matrices and Linear Equations in Two Variables.

Matrices. Augmented Matrices from Systems of Equations. Row Operations. Solving Equations by Row Reduction.

3.3 Systems of Linear Equations and the Gauss–Jordan Method.

Names for Many Variables. Row-Reduced Form.

3.4 Matrix Arithmetic.

Equality of Matrices. Transpose of a Matrix. Identity Matrix. Scalar Multiplication. Matrix Addition and Subtraction. Matrix Multiplication as Evaluation. Identity Matrices. Matrix Multiplication with Systems of Equations. Matrix Multiplication and Row Operations.

3.5 Inverse Matrices and Systems of Linear Equations.

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3.6 Introduction to Modeling: Leontief Models.

4. LINEAR PROGRAMMING.

4.1 Linear Inequalities.

Inequalities in Two Variables. Vertices of Feasible Regions. Bounded and Unbounded Regions. Applications.

4.2 Two-Variable Linear Programming Problems.

Linear Programming Problems. Fundamental Theorem of Linear Programming. Extensions to Larger Problems.

4.3 The Simplex Method for Standard Maximum Problems.

Standard Maximum Problems. Matrix Form of a Standard Maximum Problem. The Initial Simplex Tableau. Basic and Nonbasic Variables. The Pivot Element. The Pivot Operation. The Simplex Method.

4.4 Standard Minimum Problems and Duality.

Standard Minimum Problems. The Dual of a Standard Minimum Problem. Matrix Form. Mixed Constraints: A Transportation Problem.

5. PROBABILITY.

5.1 Sets, Counting, and Venn Diagrams.

Sets and Set Operations. Addition Principle for Counting. The Multiplication Principle for Counting. The Number of Subsets of a Set.

5.2 Permutations and Combinations.

Factorials. Permutations. Combinations.

5.3 Probability Spaces.

Random Experiments and Sample Spaces. Events. Probabilities of Possible Outcomes. Probabilities of Events. Probability That an Event Does Not Occur. Probability Space. Addition Rule for Probability.

5.4 Conditional Probability and Independence.

Conditional Probability. The Product Rule for Probability. Independent Events.

5.5 Bayes' Formula.

Bayes' Formula. 5.6 Random Variables and Distributions. Random Variables. Expected Value. Binomial Distribution.

6. STATISTICS.

6.1 Random Samples and Data Organization.

Random Samples. Bar Chart. Histogram.

6.2 Measures of Central Tendency.

Mode. Median. Mean. Mean, Median, and Mode.

6.3 Measures of Variation.

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6.4 Normal Distributions and Binomial Approximation.

Discrete and Continuous Random Variables. Normal Distribution. z-Scores. The Normal and Binomial

Distributions.

7. MARKOV CHAINS.

7.1 States and Transitions.

States and Transitions. Markov Chains. Types of Transition Matrices. State Distribution Vectors. The k th State Distribution Vector. Duration in a Given State.

7.2 Regular Markov Chains.

Regular Markov Chains. The Fundamental Theorem of Regular Markov Chains. How to Solve $D \bullet T = D$.

7.3 Absorbing Markov Chains.

Absorbing Markov Chains. Standard Form. Transition Times and Absorption Probabilities.

8. GAME THEORY.

8.1 Two-Person Games and Saddle Points.

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8.2 Mixed Strategies.

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