

Finite Mathematics | Table of Contents

Chapter 1: Algebra Reference

1.1 Properties of Real Numbers and Polynomials

- Properties of Real Numbers
 - Use the following properties of real numbers: inverse and identity
 - Use the following properties of real numbers: commutative, associative, and distributive
- Polynomials
 - Add and subtract polynomials
 - Multiply binomials together
 - Multiply polynomials together
 - Perform operations with polynomials of several variables
- Properties of Real Numbers and Order of Operations
 - Distinguish between natural numbers, whole numbers, and integers
 - Distinguish between rational and irrational numbers
 - Perform calculations using order of operations
 - Use the following properties of real numbers: inverse and identity
 - Use the following properties of real numbers: commutative, associative, and distributive
- Evaluate and Simplify Algebraic Expressions
 - Evaluate algebraic expressions with a single variable
 - Evaluate algebraic expressions with two variables
 - Identify constants and variables
 - Use a formula
 - Simplify algebraic expressions

1.2 Factoring

- Factoring Quadratics
 - Factor the greatest common factor of a polynomial
 - Factor a trinomial
 - Factor a trinomial by grouping
 - Factor a perfect square trinomial
 - Factor a difference of squares
- Other Factoring Techniques
 - Factor a cubic by grouping
 - Factor the sum and difference of cubes
 - Factor expressions using fractional or negative exponents
 - Factor expressions using greatest common factor and other technique

1.3 Rational Expressions

- Operations on Rational Expressions
 - Simplify rational expressions
 - Multiply rational expressions
-

- Divide rational expressions
- Add and subtract rational expressions

1.4 Equations

- Linear Equations
 - Identify identity, conditional, and inconsistent equations
 - Solve equations in one variable algebraically, variable just on one side
 - Solve equations in one variable algebraically, variable on both sides
- Quadratic Equations
 - Solve quadratic equations by factoring, leading coefficient 1
 - Solve quadratic equations by factoring, leading coefficient > 1
 - Solve quadratic equations by using the quadratic formula
- Rational Equations
 - Solve a rational equation, monomials in denominator
 - Solve a rational equation, binomials in denominator
 - Solve a rational equation, requires factoring to find least common denominator

1.5 Inequalities

- Linear Inequalities
 - Use interval notation
 - Use properties of inequalities
 - Solve simple inequalities in one variable algebraically
- Quadratic and Rational Inequalities
 - Solve quadratic inequalities in one variable, graph the solution set, and express the solution set using interval notation
 - Solve inequalities that involve rational expressions, graph the solution sets, and express the solution set using interval notation

1.6 Exponents

- Properties of Exponents
 - Understand exponent notation
 - Use the product rule of exponents
 - Use the quotient rule of exponents
 - Use the power rule of exponents
 - Advanced Properties of Exponents
 - Use the negative and zero exponent rule
 - Find the power of a product
 - Find the power of a quotient
 - Simplify exponential expressions
-

1.7 Radicals

- Simplify Radicals
 - Evaluate square roots
 - Use the product rule to simplify square roots
 - Use the quotient rule to simplify square roots
- Operations with Radicals
 - Add and subtract square roots
 - Rationalize denominators with a monomial denominator
 - Rationalize denominators using the conjugate

Chapter 2: Linear Functions

2.1 Slopes and Equations of Lines

- Cartesian Coordinate System
 - Plot ordered pairs in a Cartesian coordinate system
 - Graph equations by plotting points
- Identify Slopes and Intercepts
 - Find the slope of a line given two points
 - Understand the relationship between the slope and y-intercept of a line and its equation
 - Find x -intercepts and y -intercepts
- Finding Linear Equations
 - Find equation of a line, in slope-intercept form, given slope and one point (point-slope formula)
 - Find equation, in slope-intercept form, of a line passing through two given points
 - Given slope and intercept, find the equation of a line and write it in standard form
 - Find the equation of vertical and horizontal lines
- Graphing Linear Equations
 - Graph a linear equation using the slope and the origin
- Parallel and Perpendicular Lines
 - Given the equations of two lines, determine whether their graphs are parallel or perpendicular
 - Write the equation of a line parallel to a given line
 - Write the equation of a line perpendicular to a given line

2.2 Linear Functions and Applications

- Linear Functions
 - Understand function notation
 - Evaluate a linear function at a value
 - Applications of Linear Functions
 - Solve supply and demand problems using linear functions
 - Solve cost analysis problems using linear functions
 - Solve break even analysis problems using linear functions
-

- Mass and Temperature
 - Identify unit of mass correctly for a given situation
 - Convert between celsius and fahrenheit

2.3 The Least Squares Line

- The Least Squares Line
 - Find the linear regression equation given a list of data points
 - Make predictions using a line of best fit
 - Find and interpret the correlation coefficient

Chapter 3: Systems of Linear Equations and Matrices

3.1 Solving Linear Systems

- Linear Systems in Two Variables
 - Solve systems of equations in two variables by graphing
 - Solve systems of equations in two variables by substitution
 - Solve systems of equations in two variables by addition
 - Identify inconsistent and dependent systems of equations containing two variables, and express the solution of dependent equations
- Linear System in Three Variables
 - Determine whether an ordered triple is a solution to a system
 - Solve systems of three equations in three variables
 - Identify inconsistent and dependent systems of equations containing three variables, and express the solution of a system of dependent equations
- Applications of Linear Systems
 - Use systems of equations to investigate profits
 - Write and solve a system of equations in two variables from a word problem

3.2 Solving Linear Systems by the Gauss-Jordan Method

- Solving Systems with Gaussian Elimination
 - Convert between a system of equations and its corresponding augmented matrix
 - Use row operations to solve a system of linear equations in two variables
 - Use row operations to solve a system of linear equations in three variables
 - Use matrices to solve applications of systems of linear equations

3.3 Operations with Matrices

- Addition and Subtraction of Matrices
 - Determine the order of a matrix and describe elements within a matrix
 - Add or subtract matrices
 - Multiplication of Matrices
 - Multiply a matrix by a scalar
 - Find the sum or difference of scalar multiples
 - Multiply two matrices
-

3.4 Matrix Inverses and Determinants

- Determinants of Matrices
 - Find the determinant of a 2x2 matrix
 - Find the determinant of a 3x3 matrix
- Inverse and Identity Matrices
 - Understand the identity matrix and how it relates to the inverse matrix
 - Determine if a matrix is invertible using the determinant
 - Find the inverse of a 2x2 matrix
 - Find the inverse of a 3x3 matrix
- Solving Systems with Inverses
 - Solve a system of linear equations using the inverse of a 2x2 matrix
 - Solve a system of linear equations using the inverse of a 3x3 matrix

3.5 Input-Output Models

- Input-Output Matrices
 - Create an input output matrix for a given application
 - Calculate the amount of commodities produced given an input output matrix and a production matrix
 - Determine the production matrix that will satisfy a given demand matrix
 - Find the production of a commodity in a closed input output model

Chapter 4: Linear Programming - The Graphical Method

4.1 Graphing Linear Inequalities

- Graphs of Linear Inequalities
 - Solve a linear inequality in two variables by graphing
 - Solve a linear system of inequalities by graphing

4.2 Solving Linear Programming Problems Graphically

- Solving Linear Programming Problems Graphically
 - Graph a feasible region given a set of constraints
 - Find the maximum value of an objective function given constraints by graphing

4.3 Applications of Linear Programming

- Applications of Linear Programming
 - Solve application problems using linear programming

Chapter 5: Linear Programming - The Simplex Method

5.1 Slack Variables and the Pivot

- Finding Solutions using Initial Simplex Tableaus
 - Rewrite a linear programming problem using slack variables and create an initial simplex tableau
 - Read a solution from an initial simplex tableau
 - Find a new solution by pivoting an initial simplex tableau
-

5.2 Maximization and Minimization Problems

- Solving Maximization Problems with the Simplex Method
 - Solve maximization problems using the simplex method
- Transposing a Matrix and Finding the Dual of a Linear Programming Problem
 - Determine the transpose of a matrix
 - Determine the dual of a linear programming problem
- Solving Minimization Problems with Duality
 - Solve minimization problems using the theorem of duality

5.3 Nonstandard Problems

- Solving Nonstandard Problems
 - Solve a nonstandard linear programming problem
 - Solve a nonstandard linear programming application problem

Chapter 6: Mathematics of Finance

6.1 Simple Interest

- Simple Interest
 - Calculate simple interest
 - Calculate interest discounts on a discounted loan

6.2 Compound Interest

- Compound Interest
 - Calculate periodically compounded interest
 - Calculate compound interest
 - Calculate continuously compounded interest
 - Calculate effective annual yield
- Geometric Sequences
 - Find the common ratio of a geometric sequence
 - Write terms of a geometric sequence
 - Write a recursive formula for a geometric sequence
 - Write an explicit formula for a geometric sequences
 - Find the sum of a finite geometric sequence

6.3 Annuities, Stocks, and Bonds

- Annuities
 - Calculate the value of an annuity
 - Calculate the payment needed to achieve a determined future value
 - Stocks
 - Define stock terminology
 - Read a stock table
-

6.4 Installment Loans, Amortization, and Credit Cards

- Mortgages and Loans
 - Calculate the monthly payment and interest cost for a mortgage
 - Construct a loan amortization schedule
 - Choose the best installment loan plan
- Credit Cards
 - Recognize key features of credit cards
 - Calculate the average daily balance of a credit card
 - Determine interest to be paid on a card's next billing date

Chapter 7: Logic

7.1 Statements and Logical Connectives

- The Building Blocks of Logic
 - Identify and negate simple statements
 - Identify and negate quantified statements
- Symbolic Representation of Statements
 - Identify logical connectives and compound statements
 - Represent and/or/not statements in symbolic form and English
- Conditional Statements
 - Represent conditional statements in symbolic form and English
 - Write biconditional statements in symbolic form and English
 - Represent symbolic statements with parentheses using dominance of connectives

7.2 Truth Tables for Negation, Conjunction, and Disjunction

- Introduction to Truth Tables
 - Construct a truth table for a statement with a conjunction and/or a negation and determine its truth value
 - Construct a truth table for a statement with a disjunction and/or a negation and determine its truth value
 - Construct a truth table for a compound statement with a conjunction and disjunction and determine its truth value

7.3 Truth Tables for the Conditional and Biconditional

- Truth Tables for Conditional and Biconditional Statements
 - Construct a truth table for a conditional statement and determine its truth value
 - Construct a truth table for a biconditional statement and determine its truth value
 - Self-Contradictions, Tautologies, and Implications
 - Identify self-contradictions, tautologies, and implications
-

7.4 Equivalent Statements

- Equivalent Statements and De Morgan's Equivalence Laws
 - Determine if two symbolic statements are equivalent using a truth table
 - Determine if two statements given in English are equivalent using a truth table
 - Determine if two statements are equivalent using De Morgan's laws
- Conditional States and Equivalence
 - Convert a disjunction into an equivalent conditional statement
 - Determine if two conditional statements are equivalent

7.5 Symbolic Arguments

- Drawing and Verifying Conclusions
 - Draw a conclusion from a conditional statement
 - Determine if an argument is valid using a truth table
 - Identify and validate the standard forms of arguments

7.6 Euler Diagrams and Syllogistic Arguments

- Euler Diagrams and Syllogistic Arguments
 - Identify syllogistic arguments
 - Represent a syllogistic argument with a Euler diagram
 - Determine if a syllogistic argument is valid with a Euler diagram

7.7 Switching Circuits

- Switching Circuits and Symbolic Logic
 - Convert between symbolic statements and switching circuits
 - Determine conditions for when a lightbulb will be turned on in a switching circuit
 - Determine if two switching circuits are equivalent

Chapter 8: Sets and Counting Principles

8.1 Set Concepts

- Introduction to Sets and Set Builder Notation
 - Represent a set using a written description and the roster method
 - Represent a set using set builder notation
 - Set Equivalence
 - Identify the cardinal number for a set
 - Determine if two sets are equivalent
 - Determine if two sets are equal
 - Types of Sets
 - Identify subsets, universal sets, and empty sets
 - Distinguish between finite and infinite sets
 - Subsets and Proper Subsets
 - Identify subsets and proper subsets using set notation
 - Determine the number of subsets and proper subsets in a given set
-

8.2 Venn Diagrams and Set Operations

- Representing Sets with Venn Diagrams
 - Illustrate the universal set, a set, and complement of a set using a Venn diagram
 - Illustrate two sets using Venn diagram and set notation
- Set Relationships
 - Determine the complement of a set using Venn diagrams and proper set notation
 - Determine the intersection of two sets using Venn diagrams and set notation
 - Determine the union of two sets using Venn diagrams and set notation
- Set Operations
 - Perform operations on sets
 - Find the difference and cartesian product of two sets
 - Use Venn diagrams to find the result of set operations on two sets
 - Determine the cardinal number of a union of two finite sets

8.3 Venn Diagrams with Three Sets and Verification of Equality of Sets

- Construct a Venn Diagram of Three Sets
 - Perform set operations on three sets
 - Represent three sets using Venn diagrams

8.4 The Fundamental Counting Principle

- The Fundamental Counting Principle
 - Solve counting problems using the addition principle
 - Solve counting problems using the multiplication principle

8.5 Permutations and Combinations

- Permutations
 - Evaluate an expression with factorials
 - Find the number of permutations of n distinct objects using the multiplication principle
 - Find the number of permutations of n distinct objects using a formula
 - Find the number of permutations of n non-distinct objects
- Combinations
 - Find the number of combinations using the formula
 - Find the number of subsets of a set

Chapter 9: Probability

9.1 Introduction to Probability

- Sample Spaces and Events
 - Determine the sample space of an experiment
 - Determine an event of an experiment
 - Fundamentals of Probability
 - Compute the probability of equally likely outcomes
 - Compute the probability of equally likely outcomes in application
-

- Probability with Permutations and Combinations
 - Compute probability involving permutations
 - Compute probability involving combinations
- The Complement Rule and Probability
 - Use the complement rule to compute probabilities
 - Compute the probability of an event happening at least once
- Odds and Expected Value
 - Compute the expected value of an event
 - Compute odds using probability

9.2 Conditional Probability and Independent Events

- Independent Events
 - Compute the probability of the union of two events
 - Compute the probability of two independent events occurring
- Dependent Events and Conditional Probability
 - Compute the conditional probability of a dependent event occurring
 - Compute the probability of two or more dependent events occurring

9.3 Binomial Probability

- Binomial Experiments
 - Identify a binomial experiment
 - Determine the binomial probability of success in an experiment performed multiple times
 - Calculate expected value for binomial probability

9.4 Bayes' Theorem

- Bayes' Theorem
 - Apply Bayes' theorem to solve an application problem

9.5 Random Variables, Probability Distributions and Expected Value

- Random Variables, Probability Distributions, and Expected Value
 - Calculate probability distribution
 - Calculate the expected value of a random variable

Chapter 10: Statistics

10.1 Sampling, Frequency Distributions, and Graphs

- Sampling and Parameters
 - Understand the definitions of population, sampling, statistic, parameter, and data
 - Identify stratified, cluster, systematic, and convenience sampling
 - Identify sampling errors and bias
 - Identify situations in which statistics can be misleading
 - Frequency Distributions and Histograms
 - Construct and understand frequency tables for a set of data
 - Create and interpret histograms
 - Create and interpret stem-and-leaf plots
-

- Estimation from Graphs/Figures
 - Estimate using a pie chart or bar graph
 - Estimate using a line graph

10.2 Measures of Central Tendency and Measures of Dispersion

- Means and Medians
 - Find the mean of a set of data
 - Find the mean from a frequency table
 - Find the median of a set of data
- Modes, Midranges, and Choosing a Measurement
 - Find the mode of a set of data
 - Find the midrange of a set of data
 - Determine whether the mean, median, or mode is the best measure of center for a data set
- Standard Deviation
 - Compute the sample variance and sample standard deviation
 - Interpret the standard deviation of a set of data

10.3 The Normal Distribution, Margins of Error, and Skewness

- The Normal Distribution
 - Understand the notation and interpret the parameters of a normal distribution
 - Compute z-scores and use them to compare values from different data sets
 - Determine if a data set is skewed
- Percentiles, Quartiles, and Margins of Error
 - Find and interpret percentiles and quartiles of a data set
 - Calculate and interpret margin of error
- Problem Solving with the Normal Distribution
 - Standardize a normally distributed random variable
 - Calculate the mean and standard deviation of a standard normal distribution

Chapter 11: Nonlinear Functions

11.1 Properties of Functions

- Functions and Function Notation
 - Identify domain and range from a set of ordered pairs
 - Determine whether a relation represents a function
 - Relations and Functions
 - Determine whether a function is one-to-one
 - Use the vertical line test to identify functions
 - Use the horizontal line test to identify one-to-one functions
-

11.2 Quadratic Functions

- Characteristics of Parabolas
 - Determine axis of symmetry and vertex of parabolas from a graph
 - Determine x- and y-intercepts of parabolas from a graph
- Graphs of Quadratic Functions
 - Find the direction a parabola opens and its axis of symmetry and vertex from the general form of its equation
 - Identify the axis of symmetry and vertex of a parabola from its equation in standard form
 - Write the equation of a quadratic function given vertex and a point on a graph
 - Write the equation of a quadratic function given intercepts on a graph
 - Write the equation of a quadratic function in standard form given the equation in general form
- Applications of Quadratic Functions
 - Find the domain and range of a quadratic function
 - Determine the maximum and minimum values of quadratic functions
 - Find the x- and y-intercepts of a quadratic function

11.3 Transformations of Functions

- Transformations of Functions
 - Graph functions using vertical and horizontal shifts
 - Graph functions using reflections about the x-axis and the y-axis
 - Graph functions using compressions and stretches
 - Combine transformations

11.4 Polynomial and Rational Functions

- Polynomial Functions
 - Identify power functions and polynomial functions
 - Graph polynomial functions
 - Write a formula for a polynomial function from a graph
 - Determine equation of a polynomial given key information
 - Asymptotic Behavior of Rational Functions
 - Use arrow notation to describe local behavior and end behavior of rational functions
 - Identify vertical asymptotes and removable discontinuities of rational functions
 - Identify horizontal and slant asymptotes of rational functions
 - Graphs and Applications of Rational Functions
 - Find the intercepts of a rational function
 - Graph rational functions
 - Find the equation of a rational function from a graph
-

11.5 Exponential and Logarithmic Functions

- Identify and Evaluate Exponential Functions
 - Identify exponential functions
 - Evaluate exponential functions
 - Calculate continuous growth and decay
- Graphing Exponential Functions
 - Graph exponential functions
 - Graph exponential functions using transformations
- Relate Logarithms and Exponents
 - Convert from logarithmic to exponential form
 - Convert from exponential to logarithmic form
- Evaluate Logarithmic Expressions
 - Evaluate logarithms with positive integer solutions
 - Evaluate logarithms with negative integer solutions
 - Use common logarithms
 - Use natural logarithms
- Basic Properties of Logarithms
 - Understand the basic properties of logarithms
 - Use the product rule for logarithms
 - Use the quotient rule for logarithms
 - Use the power rule for logarithms
- Solve Logarithmic Equations
 - Use the definition of a logarithm to solve logarithmic equations
 - Use logarithm properties and the definition of the logarithm to solve logarithmic equations
 - Use the one-to-one property of logarithms to solve logarithmic equations
- Applications of Exponential and Logarithmic Functions
 - Model exponential growth
 - Model exponential decay
 - Applied logarithmic models
 - Choose an appropriate model for data
 - Express an exponential model in base e

Chapter 12: Markov Chains

12.1 Properties of Markov Chains

- Transitions
 - Identify transition diagrams and transition matrices
 - Create a transition diagram and matrix for a given word problem
-

- States
 - Find the second state of a system given a transition matrix and initial state
 - Find powers of a transition matrix
 - Solve application problems using powers of transition matrices

12.2 Regular Markov Chains

- Regular Transition Matrices and Stationary Matrices
 - Determine if a transition matrix is regular
 - Find a stationary matrix for a given transition matrix
 - Solve application problems using stationary matrices

12.3 Absorbing Markov Chains

- Absorbing States
 - Find absorbing states given a transition matrix
 - Determine if a transition matrix is for an absorbing Markov chain
 - Write a transition matrix in standard form
 - Limiting Matrix
 - Find the limiting matrix for an absorbing Markov chain
-