

Course: Precalculus

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Textbook: Advanced Mathematics: Precalculus with Discrete Mathematics and Data Analysis  
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Additional Materials recommended: Scientific or Graphing Calculator

Course Description: This is an elective math class that is strongly recommended for the college-bound student. Topics include, but are not limited to linear and quadratic functions, inequalities, exponents and logarithms, discrete mathematics and data analysis, probability, limits, and derivatives.

State of South Dakota Mathematics Standards covered:

9-12.A.1.1. (Comprehension) Write equivalent forms of algebraic expressions using properties of the set of real numbers.

9-12.A.1.1A. (Application) Write equivalent forms of rational algebraic expressions using properties of real numbers.

9-12.A.1.2A. (Application) Extend the use of real number properties to expressions involving complex numbers.

9-12.A.2.1. (Comprehension) Use algebraic properties to transform multi-step, single variable, and first-degree equations.

9-12.A.2.2. (Application) Use algebraic properties to transform multi-step, single variable, and first-degree inequalities and represent solutions using a number line.

9-12.A.2.1A. (Analysis) Determine solutions of quadratic equations.

9-12.A.3.1. (Application) Create linear models to represent problem situations.

9-12.A.3.2. (Comprehension) Distinguish between linear and nonlinear models.

9-12.A.3.1A. (Analysis) Distinguish between linear, quadratic, inverse variations, and exponential models.

9-12.A.3.2A. (Synthesis) Create formulas to model relationships that are algebraic, geometric, trigonometric, and exponential.

9-12.A.3.3A. (Analysis) Use sequences and series to model relationships.

9-12.A.4.1. (Application) Use graphs, tables, and equations to represent linear functions.

9-12.A.4.1A. (Analysis) Determine the domain, range, and intercepts of a function.

9-12.A.4.5A. (Analysis) Describe characteristics of nonlinear functions and relations.

9-12.N.1.1. (Comprehension) Identify multiple representations of a real number.

9-12.N.1.2. (Comprehension) Apply the concept of place value, magnitude, and relative

magnitude of real numbers.

9-12.N.1.1A. (Comprehension) Describe the relationship of the real number system to the complex number system.

9-12.N.1.2A. (Application) Apply properties and axioms of the real number system to various subsets, e.g., axioms of order, closure.

9-12.N.2.1. (Comprehension) Add, subtract, multiply, and divide real numbers including integral exponents.

9-12.N.2.1A. (Application) Add, subtract, multiply, and divide real numbers including rational exponents.

9-12.S.1.1. (Analysis) Draw conclusions from a set of data.

9-12.S.1.2. (Comprehension) Compare multiple one-variable data sets, using range, interquartile range, mean, mode, and median.

9-12.S.1.3. (Analysis) Represent a set of data in a variety of graphical forms and draw conclusions.

9-12.S.1.1A. (Evaluation) Analyze and evaluate the design of surveys and experiments.

9-12.S.1.2A. (Evaluation) Analyze and evaluate graphical displays of data.

9-12.S.1.3A. (Analysis) Compare multiple one-variable data sets, using standard deviation and variance.

9-12.S.1.4A. (Application) Describe the normal curve and use it to make predictions.

9-12.S.1.5A. (Application) Use scatterplots, best-fit lines, and correlation coefficients to model data and support conclusions.

9-12.S.2.1. (Knowledge) Distinguish between experimental and theoretical probability.

9-12.S.2.2. (Comprehension) Predict outcomes of simple events using given theoretical probabilities.

9-12.S.2.1A. (Application) Use probabilities to solve problems.

9-12.S.2.2A. (Application) Determine probability of compound, complementary, independent, and mutually exclusive events.

## Topics Covered

### Chapter 1 Linear and Quadratic Functions

- 1.1 Points and Lines
- 1.2 Slopes of Lines
- 1.3 Finding Equations of Lines
- 1.4 Linear Functions and Models
- 1.5 Complex Numbers
- 1.6 Solving Quadratic Equations
- 1.7 Quadratic Functions and Graphs
- 1.8 Quadratic Models

### Chapter 5 Exponents and Logarithms

- 5.1 Growth and Decay: Integral Exponents
- 5.2 Growth and Decay: Rational Exponents
- 5.3 Exponential Functions
- 5.4 The Number  $e$  and the Function  $e^x$
- 5.5 Logarithmic Functions
- 5.6 Laws of Logarithms
- 5.7 Exponential Equations and Changing Bases

### Chapter 13 Sequences and Series

- 13.1 Arithmetic and Geometric Sequences
- 13.2 Recursive Definitions
- 13.3 Arithmetic and Geometric Series and their Sums
- 13.4 Limits of Infinite Series
- 13.5 Sums of Infinite Series
- 13.6 Sigma Notation
- 13.7 Mathematical Induction

### Chapter 18 Curve Fitting and Models

- 18.1 Introduction into Curve Fitting
- 18.2 Fitting Exponential Curves
- 18.3 Fitting Power Curves
- 18.4 Choosing the Best Model

## Chapter 19 Limits, Series and Iterated Functions

- 19.1 Limits of Functions
- 19.2 Graphs of Rational Functions
- 19.3 Using Technology to Approximate the Area under a Curve
- 19.4 Power Series
- 19.5 Analyzing Orbits
- 19.6 Applications of Iterated Functions

## Chapter 20 An Introduction to Calculus

- 20.1 The Slope of a Curve
- 20.2 Using Derivatives in Curve Sketching
- 20.3 Extreme Value Problems
- 20.4 Velocity and Acceleration

## Chapter 14 Matrices

- 14.1 Matrix Addition and Scalar Multiplication
- 14.2 Matrix Multiplication
- 14.3 Applying Matrices to Linear Systems
- 14.4 Communication Matrices
- 14.5 Transition Matrices
- 14.6 Transformation Matrices

## Chapter 15 Combinatorics

- 15.1 Venn Diagrams
- 15.2 The Multiplication, Addition and Complement Principles
- 15.3 Permutations and Combinations
- 15.4 Permutations with Repetition; Circular Permutations
- 15.5 The Binomial Theorem; Pascal's Triangle

## Chapter 16 Probability

- 16.1 Introduction to Probability
- 16.2 Probability of Events Occurring Together
- 16.3 The Binomial Probability Theorem
- 16.4 Probability Problems Solved with Combinations
- 16.5 Working with Conditional Probability
- 16.6 Expected Value