

AP Precalculus Overview (Units & Topics)

Textbook: *Precalculus 2e* from OpenStax (digital download available free of charge at <https://openstax.org/>)

Semester 1**Unit 1: Polynomial & Rational Functions** (Aug. 12 until Sept. 27)

Textbook: Chapter 1 Sections 1-3, 5-6; Chapter 2; Chapter 3; Chapter 11 Section 6

Unit 1A: Linear, Quadratic, & Polynomial Functions (August 12-29)

- Function Notation
- Increasing & Decreasing Functions and Average Rate of Change
- Concavity & Inflection Points
- Symmetry of Functions
- Domain & Range
- Linear Functions
- End Behavior using Limit Notation
- Quadratic Functions
- Turning Points and Extrema
- Rational Zeroes of Polynomials
- Complex Zeroes of Polynomials
- Graphs of Polynomials

Unit 1B: Rational Functions and Functional Models (August 30 - Sept. 27)

- Transformations of Rational Functions
- Horizontal Asymptotes and End Behavior
- Vertical Asymptotes using Limit Notation
- Removable Discontinuities using Limit Notation
- Oblique Asymptotes and Crossing Points
- Graphs of Rational Functions
- Direct & Inverse Variation and Model Selection
- Linear, Quadratic, Polynomial, & Rational Models
- Polynomial & Rational Inequalities in One Variable
- The Binomial Theorem
- General Transformations of Functions & the Function Library
- Piecewise Functions

Unit 2: Exponential & Logarithmic Functions (Sept. 30 - Nov. 14)

Textbook: Chapter 4; Chapter 11 Sections 1-4

Unit 2A: Exponential Growth & Decay (Sept. 30 – Oct. 22)

- Sequence Notation and Types of Sequences
- Series Definitions and Summation Notation
- Arithmetic Sequences
- Geometric Sequences
- Arithmetic Series
- Geometric Series and Convergence vs. Divergence

Linear Growth vs. Exponential Growth
Exponential Functions and Graphs
The Rules of Exponents
Transformations of Exponential Functions
Exponential Models
Composition of Functions
Inverses of Functions

Unit 2B: Composite Functions & Logarithms (Oct. 23 – Nov. 14)

Graphical Inverse of an Exponential Function
Logarithmic Properties
Simplifying Using Logarithms and Logarithmic Properties
Logarithmic Functions and Graphs
Solving Exponential Equations
Solving Logarithmic Equations
Exponential and Logarithmic Inequalities in One Variable
Logarithmic Models
Exponential and Logarithmic Regressions
Semi-Log Plots
Regression Model Selection

Review Interlude: Geometric Trigonometry Review and Semester Review (Nov. 15 - Dec. 16)

Textbook: Chapter 5 Sections 1 & 4; Chapter 8 Sections 1 & 2

Right Triangle Trigonometric Ratios
Right Triangle Trigonometric Applications
The Law of Sines
The Law of Cosines
The Sine-Area Rule and Heron's Formula
Trigonometry in the Coordinate Plane
Reference Triangles in the Coordinate Plane
Matrix Operations
Determinant & Inverse of a Matrix
Row Operations & Finding Inverses with Row Operations

Semester 1 Exams: Dec. 17-20

Winter Break: Dec. 23-Jan. 6

Unit 3: Trigonometric and Polar Functions (Jan. 7-March 7)

Textbook: Chapter 5, Chapter 6, Chapter 7, Chapter 8 Sections 3-5

Unit 3A: The Unit Circle, Trigonometric Functions and Models (Jan. 7-Feb. 3)

Periodic Functions
Radian and Degree Measure
Arc Length & Angular Velocity
The Unit Circle

Trigonometric Values as Functions
Sinusoidal Functions Using Sine and Cosine
Transformations of Sinusoidal Functions
Graphs of Sinusoidal Functions
Sinusoidal Models
Transformations of Other Trigonometric Functions
Graphs of Other Trigonometric Functions
Inverse Trigonometric Functions

Unit 3B: Analytic Trigonometry (Feb. 4-21)

Reciprocal Identities
Quotient Identities
Pythagorean Identities
Simplifying & Verifying Using Identities
Cofunction Identities
Even/Odd Identities
Sum & Difference Identities
Double-Angle & Half-Angle Identities
Product-Sum Identities
Solving Trigonometric Equations
Algebra Techniques for Trigonometric Equations
Trigonometric Model Applications

Unit 3C: Polar Functions (Feb. 24-March 7)

Plotting Polar Points
Converting Between Polar & Rectangular Forms
Graphing Polar Functions
Types of Polar Functions
Rates of Change in Polar Functions
Complex Numbers in Polar Form
Complex Powers and Roots

Spring Break: March 10-14

Unit 4A: Conic Sections & Parametrics (March 17 – April 11)

Textbook: Chapter 10 Sections 1-3 & 5, Chapter 8 Sections 6-8

Circles in Conic Form
Parabolas in Conic Form
Ellipses in Conic Form
Hyperbolas in Conic Form
Graphing a General Conic
Eccentricity of a Conic
Identifying a Rotated Conic
Parametric Equations & Plane Curves
Graphing Parametric Functions
Rates of Change in Parametric Functions
Conics in Parametric Form
Conics in Polar Form

Review Interlude: AP Review (April 14-May 9)

- Functions Review
- Polynomials Review
- Mock Exam
- Rationals Review
- Exponentials Review
- Logarithms Review
- Rates of Change Review
- Function Modeling Review
- Trigonometry Review
- Polar Review
- Review Mock Exam

AP Precalculus Exam: May 13 (morning exam)

Unit 4B: More Vectors and Miscellaneous Topics (May 14-29)

- Defining Vectors
- Magnitude, Direction, and Components
- Graphing Vectors in the Plane
- Vector Addition & Subtraction
- Dot Products
- Angles Between Vectors
- Vectors in 3D Space
- Matrix Review
- Vector-Valued Functions
- Cross Products and Their Applications
- Partial Fraction Decomposition

Semester 2 Exams: May 30 - June 4

All dates are subject to change in case of inclement weather or other emergency