2024-2025

Rapid City
Stevens High School

# AP Precalculus

## RCAS Policies/Procedures:

Students will be required to follow all RCAS policies and procedures. To view the RCAS High School Student Handbook, click handbook.

## Course Description:

AP Precalculus prepares a college-bound student for their first course in calculus. The course includes the study of advanced functions, including polynomial, exponential, logarithmic, trigonometric, and circular functions. Students will study the algebraic relationships between these functions, their graphs, and transformations of these functions. Students will also be introduced tothe concepts of limits.

## Textbook:

Precalculus with Trigonometry

Publisher: Kendall Hunt

## Required Resources:

None

## "Limited Choice" Resources: (students will be asked to choose at least one title from this list)

None

## Student Choice:

Will student be asked to choose additional reading material from the classroom or school library?

No

**Essential Questions:**

What does it look like to demonstrate procedural and symbolic fluency?
What does it look like to show multiple representations?
What does it look like for students to communicate and reason?

**Essential Learning Intentions:**

Unit 1 – Polynomial and Rational Functions (30 – 40% of exam) (30 – 40 class periods)

1.1 – Change in Tandem (2 class periods)
1.1.A – Describe how the input and output values of a function vary together by comparing function values.
1.1.B – Construct a graph representing two quantities that vary with respect to each other in a contextual scenario.
1.2 – Rates of Change (2 class periods)
1.2.A – Compare the rates of change at two points using average rates of change near the points.
1.2.B – Describe how two quantities vary together at different points and over different intervals of a function.

1.3 – Rates of Change in Linear and Quadratic Functions (2 class periods)
1.3.A – Determine the average rates of change for sequences and functions, including linear, and other function types.
1.3.B – Determine the change in the average rates of change for linear, quadratic, and other function types.
1.4 – Polynomial Functions and Rates of Change (2 class periods)
1.4.A – Identify key characteristics of polynomial functions related to rates of change.

1.5 – Polynomial Functions and Complex Zeros (2 – 3 class periods)
1.5.A – Identify key characteristics of a polynomial function related to its zeros when suitable factorizations are available or with technology.
1.5.B – Determine if a polynomial function is even or odd.

1.6 – Polynomial Functions and End Behavior (1 – 2 class periods)
1.6.A – Describe end behaviors of polynomial functions.
1.7 – Rational Functions and End Behavior (2 – 3 class periods)
1.7.A – Describe end behaviors of rational functions.
1.8 – Rational Functions and Zeros (1 – 2 class periods)
1.8.A – Determine the zeros of rational functions.
1.9 – Rational Functions and Vertical Asymptotes (1 – 2 class periods)
1.9.A – Determine vertical asymptotes of graphs of rational functions.

1.10 – Rational Functions and Holes (1 – 2 class periods)

1.10.A – Determine holes in graphs of rational functions.

1.11 – Equivalent Representations of Polynomial and Rational Expressions (2 – 3 class periods)

1.11.A – Rewrite polynomial and rational expressions in equivalent forms.

1.11.B – Determine the quotient of two polynomial functions using long division.

1.11.C – Rewrite the repeated product of binomials using the binomial theorem.

1.12 – Transformations of Functions (2 – 3 class periods)

1.12.A – Construct a function that is an additive and/or multiplicative transformation of another function.

1.13 – Function Model Selection and Assumption Articulation (2 – 3 class periods)

1.13.A – Identify an appropriate function type to construct a function model for a given scenario.

1.13.B – Describe assumptions and restrictions related to building a function model.

1.14 – Function Model Construction and Application (2 – 3 class periods)

1.14.A – Construct a linear, quadratic, cubic, quartic, polynomial of degree n, or related
piecewise-defined function model.

1.14.B – Construct a rational function model based on a context.

1.14.C – Apply a function model to answer questions about a data set or contextual scenario.

Unit 2 – Exponential and Logarithmic Functions (27 – 40% of exam) (30 – 45 class periods)

2.1 – Change in Arithmetic and Geometric Sequences (2 class periods)

2.1.A – Express arithmetic sequences found in mathematical and contextual scenarios as functions of the whole numbers.

2.1.B – Express geometric sequences found in mathematical and contextual scenarios as functions of the whole numbers.

2.2 – Change in Linear and Exponential Functions (2 class periods)

2.2.A – Construct functions of the real numbers that are comparable to arithmetic and geometric sequences.

2.2.B – Describe similarities and differences between linear and exponential functions.

2.3 – Exponential Functions (1 – 2 class periods)

2.3.A – Identify key characteristics of exponential functions.

2.4 – Exponential Function Manipulation (2 class periods)

2.4.A – Rewrite exponential expressions in equivalent forms.

2.5 – Exponential Function Context and Data Modeling (2 – 3 class periods)

2.5.A – Construct a model for situations involving proportional output values

over equal-length input-value intervals.

2.5.B – Apply exponential models to answer questions about a data set or contextual scenario.

2.6 – Competing Function Model Validation (2 – 3 class periods)

2.6.A – Construct linear, quadratic, and exponential models based on a data set.

2.6.B – Validate a model constructed from a data set.

2.7 – Composition of Functions (2 – 3 class periods)

2.7.A – Evaluate the composition of two or more functions for given values.

2.7.B – Construct a representation of the composition of two or more functions.

2.7.C – Rewrite a given function as a composition of two or more functions.

2.8 – Inverse Functions (2 – 3 class periods)

2.8.A – Determine the input-output pairs of the inverse of a function.

2.8.B – Determine the inverse of a function on an invertible domain.

2.9 – Logarithmic Expressions (1 – 2 class periods)

2.9.A – Evaluate Logarithmic expressions.

2.10 – Inverses of Exponential Functions (2 class periods)

2.10.A – Construct representations of the inverse of an exponential function with an initial value of 1.

2.11 – Logarithmic Functions (1 – 2 class periods)

2.11.A – Identify key characteristics of logarithmic functions.

2.12 – Logarithmic Function Manipulation (2 – 3 class periods)

2.12.A – Rewrite logarithmic expressions in equivalent forms.

2.13 – Exponential and Logarithmic Equations and Inequalities (3 – 4 class periods)

2.13.A – Solve exponential and logarithmic equations and inequalities.

2.13.B – Construct the inverse function for exponential and logarithmic functions.

2.14 – Logarithmic Function Context and Data Modeling (2 – 3 class periods)

2.14.A – Construct a logarithmic function model.

2.15 – Semi-log Plots (2 – 3 class periods)

2.15.A – Determine if an exponential model is appropriate by examining a semi-log plot of a data set.

2.15.B – Construct the linearization of exponential data.

Unit 3 – Trigonometric and Polar Functions (30 – 35% of Exam) (35 – 50 class periods)

3.1 – Periodic Phenomena (2 class periods)

3.1.A – Construct graphs of periodic relationships based on verbal representations.

3.1.B – Describe key characteristics of a periodic function based on a verbal representation.

3.2 – Sine, Cosine, and Tangent (2 – 3 class periods)

3.2.A – Determine the sine, cosine, and tangent of an angle using the unit circle.

3.3 – Sine and Cosine Function Values (2 – 3 class periods)

3.3.A – Determine coordinates of points on a circle centered at the origin.

3.4 – Sine and Cosine Function Graphs (2 – 3 class periods)

3.4.A – Construct representations of the sine and cosine functions using the unit circle.

3.5 – Sinusoidal Functions (2 – 3 class periods)

3.5.A – Identify key characteristics of the sine and cosine functions.

3.6 – Sinusoidal Function Transformations (2 – 3 class periods)

3.6.A – Identify the amplitude, vertical shift, period, and phase shift of a sinusoidal function.

3.7 – Sinusoidal Function Context and Data Modeling (2 – 3 class periods)

3.7.A – Construct sinusoidal function models of periodic phenomena.

3.8 – The Tangent Function (2 class periods)

3.8.A – Construct representations of the tangent function using the unit circle.

3.8.B – Describe key characteristics of the tangent function.

3.8.C – Describe additive and multiplicative transformations involving the tangent function.

3.9 – Inverse Trigonometric Functions (2 – 3 class periods)

3.9.A – Construct analytical and graphical representations of the inverse of the sine, cosine, and tangent functions over a restricted domain.

3.10 – Trigonometric Equations and Inequalities (3 – 4 class periods)

3.10.A – Solve equations and inequalities involving trigonometric functions.

3.11 – The Secant, Cosecant, and Cotangent Functions (2 class periods)

3.11.A – Identify key characteristics of functions that involve quotients of the sine and cosine functions.

3.12 – Equivalent Representations of Trigonometric Functions (3 – 4 class periods)

3.12.A – Rewrite trigonometric expressions in equivalent forms with the Pythagorean identity.

3.12.B – Rewrite trigonometric expression in equivalent forms with sine and cosine sum identities.

3.12.C – Solve equations using equivalent analytic representations of trigonometric functions.

3.13 – Trigonometric and Polar Coordinates (2 – 3 class periods)

3.13.A – Determine the location of a point in the plane using both rectangular and polar coordinates.

3.14 – Polar Function Graphs (2 – 3 class periods)

3.14.A – Construct graphs of polar functions.

3.15 – Rates of Change in Polar Functions (2 – 3 class periods)

3.15.A – Describe characteristics of the graph of a polar function.