Brecksville-Broadview Heights City School District

Curriculum Framework

Brecksville-Broadview Heights City Schools
6638 Mill Rd
Brecksville, Ohio 44141

Advanced Placement Precalculus 2025

District Leadership

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Acknowledgment

This document represents a strong effort on the part of the following individuals:

- Donna Morlani

Brecksville
Broadview Heights
City School District

who we are. where we are going. what we value.

OUR MISSION

The BBHCSD exists to rigorously educate our students to the highest standards, to boldly empower our school family with exciting learning experiences, and to collaboratively engage our community to cultivate productive future citizens of a global society.

OUR VISION

The BBHCSD will be the destination district by pushing the boundaries of academic excellence and expanding innovative opportunities for students, while advocating for all, in a safe and accountable educational environment.

OUR VALUES

- We value academic excellence and providing innovative learning opportunities for all
- We value school safety and security in protocol, thought, and action to create a welcoming school climate
- We value responsible stewardship of the dynamic resources in the BBHCSD
- We value the finest educators and staff to empower our students
- We value transparent, engaging, and collaborative communications
- We value the comprehensive preparedness of our students' future success

OUR CULTURE

The BBHCSD will encourage all to Bee Your Best, Bee The Future, and Bee One Community, and will accomplish this by building safety, sharing vulnerability, and establishing a shared purpose with the values above.

Together, we will ***Protect the Banner of the BBHCSD.***

Instructional & Curricular Philosophy

The curriculum and instruction of the Brecksville Broadview Heights City School District will provide an educational program to assist all students to realize their potential to make a positive impact as contributing members of a global society. Both the curriculum and the instructional process reflect that each student is a unique individual and learner.

Students are prepared for their futures through strong curriculum and instructional practices instilling the competencies of Emotionally-Prepared, Future-Ready, Globally-Responsible, and Self-Reliant. In addition, all learners understand the outcomes of Always Improving, Stronger Together, and Leave a Legacy stated in the district's culture playbook. Additionally, the curriculum and instruction aims to achieve with all learners the Culture Playbook outcomes Always Improving, Stronger Together and Leave a Legacy.

Students are at the center of all we do in the Brecksville Broadview Heights City School District. We practice standards-driven curriculum and instruction in all content areas:

- We anchor all learning in Ohio's learning standards.
- We utilize data-driven, evidence-based instruction and decision making.
- We utilize assessments directly aligned to Ohio's learning standards to collect data on student growth and mastery, adjusting and adapting instruction to meet the learning needs of all students.
- We foster a culture of continuous growth in learning for both students and staff.
- We believe that learning is a lifelong pursuit and that everyone has the capacity to grow and continually learn.
- We provide supportive learning environments that encourage active engagement, curiosity, exploration, and rigorous levels of learning.

Brecksville
Broadview Heights
City School District

EDUCATE. EMPOWER. ENGAGE.

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ATTRIBUTES OF A BEE

FUTURE READY

BBH students will become lifelong learners and acquire career knowledge along with core technical skills. Bees will be independent thinkers, problem-solvers and possess communications and listening skills.

EMOTIONALLY PREPARED

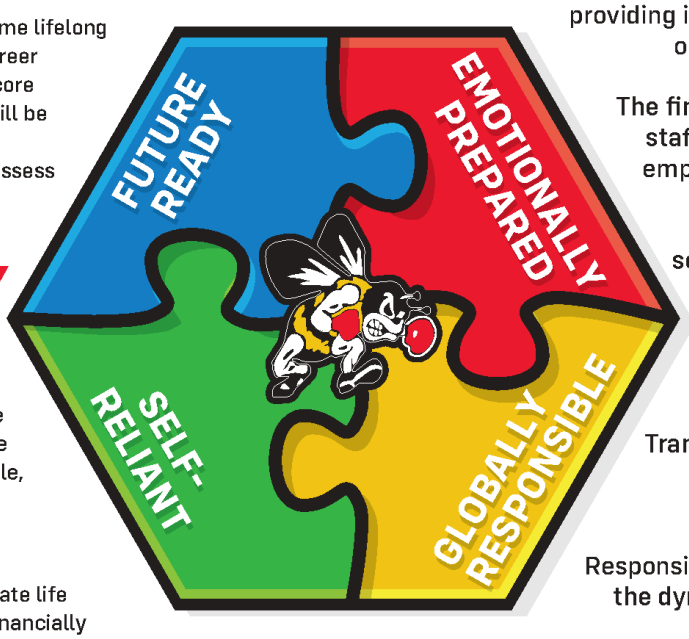
Bees will be self-aware and self-confident and have a growth mindset, while being resilient, adaptable, and flexible.

SELF-RELIANT

Bees will have appropriate life skills, be resourceful, financially savvy, and be self-directed.

GLOBALLY RESPONSIBLE

Our graduates will be engaged citizens, team collaborators, strong stewards of the environment, with broad horizons.



OUR COMMUNITY'S SCHOOL VALUES

Academic excellence and providing innovative learning opportunities for all

The finest educators and staff to constructively empower our students

School safety and security in protocol, action, thought in creating a welcoming school climate

Transparent, engaging and collaborative communications

Responsible stewardship of the dynamic resources in the BBHCSD

Comprehensive preparedness of our students' future college and career pathways

Protecting the Banner of the BBHCSD!

Precalculus and Honors Precalculus

District Overview of Content

AP Precalculus centers on functions modeling dynamic phenomena. This research-based exploration of functions is designed to better prepare students for college-level calculus and provide grounding for other mathematics and science courses. In this course, students study a broad spectrum of function types that are foundational for careers in mathematics, physics, biology, health science, business, social science, and data science. Furthermore, as AP Precalculus may be the last mathematics course of a student's secondary education, the course is structured to provide a coherent capstone experience rather than exclusively focusing on preparation for future courses.

Throughout this course, students develop and hone symbolic manipulation skills, including solving equations and manipulating expressions, for the many function types throughout the course. Students also learn that functions and their compositions, inverses, and transformations are understood through graphical, numerical, analytical, and verbal representations, which reveal different attributes of the functions and are useful for solving problems in mathematical and applied contexts. In turn, the skills learned in this course are widely applicable to situations that involve quantitative reasoning.

AP Precalculus fosters the development of a deep conceptual understanding of functions. Students learn that a function is a mathematical relation that maps a set of input values—the domain—to a set of output values—the range—such that each input value is uniquely mapped to an output value. Students understand functions and their graphs as embodying dynamic covariation of quantities, a key idea in preparing for calculus. With each function type, students develop and validate function models based on the characteristics of a bivariate data set, characteristics of covarying quantities and their relative rates of change, or a set of characteristics such as zeros, asymptotes, and extrema. These models are used to interpolate, extrapolate, and interpret information with different degrees of accuracy for a given context or data set. Additionally, students also learn that every model is subject to assumptions and limitations related to the context. As a result of examining functions from many perspectives, students develop a conceptual understanding not only of specific function types but also of functions in general. This type of understanding helps students to engage with both familiar and novel contexts.

The AP Precalculus Course description is copied directly from the course and exam description

Specific Grade Level Overview

The AP Precalculus course framework outlines the knowledge, skills, and understanding students need for success, emphasizing preparation for advanced math and real-world problem-solving. These units, along with their weightings on the AP Exam's multiple-choice section, are outlined in the course materials. Pacing recommendations

are provided at the unit level and in the Course at a Glance to guide teachers in teaching the required content and administering Personal Progress Checks. The course is divided into four units, with Units 1–3 included on the AP Exam. Unit 4 is optional and based on local requirements. Pacing recommendations are based on a typical school schedule (five 45-minute classes per week), but teachers can adjust based on their needs. Each unit is divided into topics, most of which can be taught in 1–3 class periods, though pacing is flexible.

Units of Study

- Unit 1: Polynomial and Rational Functions
- Unit 2: Exponential and Logarithmic Functions
- Unit 3: Trigonometric and Polar Functions
- Unit 4: Functions Involving Parameters, Vectors, and Matrices

Materials

CPM Textbook
DeltaMath
Pear Assessment
Desmos
AP Classroom

Assessments

Formative Assessments
Summative Assessments
AP Exam (Required Exam for Enrolled Students)

Content Standards

College Board's Learning Standards for AP Precalculus

Scope and Sequence of Knowledge and Skills to Be Learned

First Quarter

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.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.A Determine the average rates of change for sequences and functions, including linear, quadratic, 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.A Identify key characteristics of polynomial functions related to rates of change.
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.A Describe end behaviors of polynomial functions.
1.7.A Describe end behaviors of rational functions.
1.8.A Determine the zeros of rational functions.
1.9.A Determine vertical asymptotes of graphs of rational functions.
1.10.A Determine holes in graphs of rational functions.
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.A Construct a function that is an additive and/or multiplicative transformation of another function.
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.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.

Second Quarter

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.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.A Identify key characteristics of exponential functions.
2.4.A Rewrite exponential expressions in equivalent forms.
2.5.A Construct a model for situations involving proportional output values over equal-length input-value interval
2.5.B Apply exponential models to answer questions about a data set or contextual scenario.
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.A Evaluate the composition of two or more functions for given values
2.7.B Construct a representation of the composition of 2 or more functions.
2.7.C Rewrite a given function as a composition of two or more functions.

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.A Evaluate logarithmic expressions.
2.10.A Construct representations of the inverse of an exponential function with an initial value of 1.
2.11.A Identify key characteristics of logarithmic functions.
2.12.A Rewrite logarithmic expressions in equivalent forms.
2.13.A Solve exponential and logarithmic equations and inequalities.
2.13.B Construct the inverse function for exponential and logarithmic functions.
2.14.A Construct a logarithmic function model.
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.

Third Quarter

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.A Determine the sine, cosine, and tangent of an angle using the unit circle.
3.3.A Determine coordinates of points on a circle centered at the origin.
3.4.A Construct representations of the sine and cosine functions using the unit circle.
3.5.A Identify key characteristics of the sine and cosine functions.
3.6.A Identify the amplitude, vertical shift, period, and phase shift of a sinusoidal function.
3.7.A Construct sinusoidal function models of periodic phenomena.
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.A Construct analytical and graphical representations of the inverse of the sine, cosine, and tangent functions over a restricted domain.
3.10.A Solve equations and inequalities involving trigonometric functions.
3.11.A Identify key characteristics of functions that involve quotients of the sine and cosine functions.
3.12.A Rewrite trigonometric expressions in equivalent forms with the Pythagorean identity
3.12.B Rewrite trigonometric expressions in equivalent forms with sine and cosine sum identities.
3.12.C Solve equations using equivalent analytic representations of trigonometric functions.
3.13.A Determine the location of a point in the plane using both rectangular and polar coordinates.
3.14.A Construct graphs of polar functions.
3.15.A Describe characteristics of the graph of a polar function

Fourth Quarter

4.1.A Construct a graph or table of values for a parametric function represented analytically.
4.2.A Identify key characteristics of a parametric planar motion function that are related to position.
4.3.A Identify key characteristics of a parametric planar motion function that are related to direction and rate of change.
4.4.A Express motion around a circle or along a line segment parametrically.
4.5.A Construct a graph of an equation involving two variables.
4.5.B Determine how the two quantities related in an implicitly defined function vary together.
4.6.A Represent conic sections with horizontal or vertical symmetry analytically
4.7.A Represent a curve in the plane parametrically.
4.8.A Identify characteristics of a vector
4.8.B Determine sums and products involving vectors.
4.8.C Determine a unit vector for a given vector.
4.8.D Determine angle measures between vectors and magnitudes of vectors involved in vector addition.
4.9.A Represent planar motion in terms of vector-valued functions.
4.10.A Determine the product of two matrices.
4.11.A Determine the inverse of a 2 x 2 matrix
4.11B Apply the value of the determinant to invertibility and vectors.
4.12.A Determine the output vectors of a linear transformation using a 2 x 2 matrix.
4.13.A Determine the association between a linear transformation and a matrix.
4.13.B Determine the composition of two linear transformations.
4.13.C Determine the inverse of a linear transformation.
4.14.A Construct a model of a scenario involving transitions between two states using matrices.
4.14.B Apply matrix models to predict future and past states for n transition steps.