

AP Precalculus

About the Advanced Placement Program (AP)

The Advanced Placement Program (AP) has enabled millions of students to take college-level courses and earn college credit, advanced placement, or both, while still in high school. AP Exams are given each year in May. Students who earn a qualifying score on an AP Exam are typically eligible, in college, to receive credit, placement into advanced courses, or both. Every aspect of AP course and exam development is the result of collaboration between AP teachers and college faculty. They work together to develop AP courses and exams, set scoring standards, and score the exams. College faculty review every AP teacher's course syllabus.

AP Precalculus Program

AP Precalculus develops students' understanding of functions modeling dynamic phenomena. 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 the course, the mathematical practices of procedural and symbolic fluency, multiple representations, and communication and reasoning are developed. Students experience the concepts and skills related to each function type through the lenses of modeling and covariation, and engage each function type through their graphical, numerical, analytical, and verbal representations.

AP Precalculus Course Overview

AP Precalculus is designed to be the equivalent of a first semester college precalculus course. AP Precalculus provides students with an understanding of the concepts of college algebra, trigonometry, and additional topics that prepare students for further college-level mathematics courses. This course explores a variety of function types and their applications—polynomial, rational, exponential, logarithmic, trigonometric, polar, parametric, vector-valued, implicitly defined, and linear transformation functions using matrices.

PREREQUISITES

Before studying precalculus, all students should develop proficiency in topics typically found in the Algebra 1-Geometry-Algebra 2 (AGA) content sequence. Students should have developed the following:

- Proficiency with the skills and concepts related to linear and quadratic functions, including algebraic manipulation, solving equations, and solving inequalities
- Proficiency in manipulating algebraic expressions related to polynomial functions, including polynomial addition and multiplication, factoring quadratic trinomials, and using the quadratic formula

- Proficiency in solving right triangle problems involving trigonometry
- Proficiency in solving systems of equations in two and three variables
- Familiarity with piecewise-defined functions
- Familiarity with exponential functions and rules for exponents
- Familiarity with radicals (e.g., square roots, cube roots)
- Familiarity with complex numbers
- Familiarity with communicating and reasoning among graphical, numerical, analytical, and verbal representations of functions

AP Precalculus Course Content

The course content is organized into units of study, which have been arranged in the following suggested, logical sequence:

- **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

Units 1, 2, and 3 topics comprise the content and conceptual understandings that colleges and universities typically expect students to be proficient in in order to qualify for college credit and/or placement. Therefore, these topics are included on the AP Exam. Unit 4 consists of topics that teachers may include based on state or local requirements.

AP Precalculus Mathematical Practices

Students should develop the following mathematical practices while exploring course concepts:

- **Procedural and Symbolic Fluency:** Algebraically manipulate functions, equations, and expressions.
- **Multiple Representations:** Translate mathematical information between representations.
- **Communication and Reasoning:** Communicate with precise language, and provide rationales for conclusions.

AP Precalculus Exam Structure

AP PRECALCULUS EXAM: 3 HOURS

Assessment Overview

The AP Precalculus Exam assesses student understanding of the mathematical practices and learning objectives outlined in the course framework inclusive of Units 1, 2, and 3. The exam is 3 hours long and includes 40 multiple-choice questions and 4 six-point free-response questions, each weighted equally and scored on an analytic scale.

Format of Assessment:

Section I: Multiple-choice | 40 Questions | 2 hours | 62.5% of Exam Score

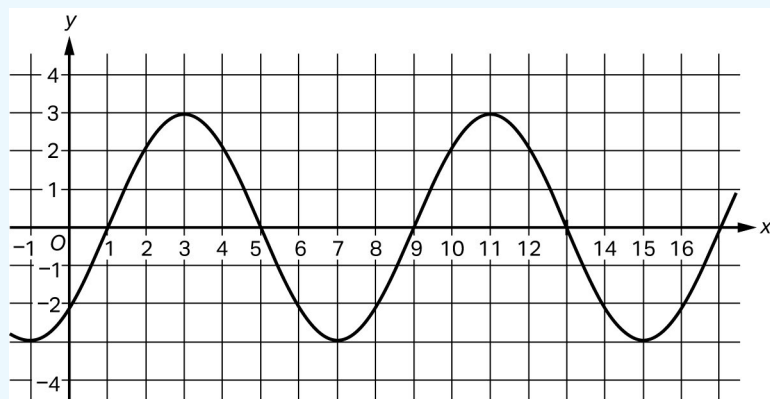
- **Part A:** 28 questions; 80 minutes (no calculator is permitted; **43.75% of Exam Score**)
- **Part B:** 12 questions; 40 minutes (graphing calculator required; **18.75% of Exam Score**)

Section II: Free-response | 4 Questions | 1 hour | 37.5% of Exam Score

- **Part A:** 2 questions; 30 minutes (graphing calculator required; **18.75% of Exam Score**)
- **Part B:** 2 questions; 30 minutes (no calculator is permitted; **18.75% of Exam Score**)

Exam Components

Sample Multiple-Choice Questions



Graph of g

The figure shows the graph of a sinusoidal function g . What are the values of the period and amplitude of g ?

- (A) The period is 4, and the amplitude is 3.
- (B) The period is 8, and the amplitude is 3.
- (C) The period is 4, and the amplitude is 6.
- (D) The period is 8, and the amplitude is 6.

Which of the following functions has a zero at $x = 3$ and has a graph in the xy -plane with a vertical asymptote at $x = 2$ and a hole at $x = 1$?

- (A) $h(x) = \frac{x^2 - 4x + 3}{x^2 - 3x + 2}$
- (B) $j(x) = \frac{x^2 - 5x + 6}{x^2 - 3x + 2}$
- (C) $k(x) = \frac{x - 3}{x^2 - 3x + 2}$
- (D) $m(x) = \frac{x - 3}{x^2 - 4x + 3}$

x	$g(x)$
-2	4
0	$\frac{1}{2}$
3	-2
4	3
36	9

The table gives values of the function g for selected values of x . The function f is given by $f(x) = 3^x + x^2$. What is the value of $f(g(3))$?

- (A) -72
- (B) $\frac{37}{9}$
- (C) 9
- (D) 97