# MahadtheMentor Road to a 5: AP Precalculus

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Gohar and I are working on a **secret project** to help you **build the best ECs.** Fill out the **waitlist form here**, and we'll let you know the second it drops!

## 🔢 AP Precalculus Key Terms

Flipped Math AP Precalculus
Fiveable AP Precalculus Library
Knowt AP Precalculus Notes
Quizlet AP Precalculus Sets
Past FRQs (College Board)
The Algebros (YouTube)
Course and Exam Description
Solving FRQs By Type

## 📃 AP Precalculus Exam Breakdown

**Exam Format Overview**

| Section | Question Type | # of Questions | Exam Weighting | Timing |
|---|---|---|---|---|
| Section I, Part A | Multiple-Choice (No Calculator) | 28 | 43.75% | 80 minutes |
| Section I, Part B | Multiple-Choice (Graphing Calculator Required) | 12 | 18.75% | 40 minutes |
| Section II, Part A | Free-Response (Graphing Calculator Required) | 2 | 18.75% | 30 minutes |
| Section II, Part B | Free-Response (No Calculator) | 2 | 18.75% | 30 minutes |

**Total Exam Time: 3 hours**

**Section I: Multiple-Choice Questions**

Section I includes 40 multiple-choice questions worth a combined 62.5% of your score. Part A (28 questions, 80 minutes, no calculator) tests symbolic and procedural fluency. Part B (12 questions, 40 minutes, graphing calculator required) tests modeling and applied work. Calculators must be in radian mode for the AP Exam.

**Section II: Free Response**

| Question | Type | Points | Calculator? | Notes |
|---|---|---|---|---|
| FRQ 1 | Function Concepts | 6 | Yes (Part A) | Functions presented graphically, numerically, and analytically. Composition, inverses, zeros, end behavior, model selection. |
| FRQ 2 | Modeling a Non-Periodic Context | 6 | Yes (Part A) | Real-world context — polynomial, piecewise, exponential, or logarithmic. Build a system of equations, compute average rates of change, justify model assumptions. |
| FRQ 3 | Modeling a Periodic Context | 6 | No (Part B) | Sinusoidal model from a real-world context. Identify five labeled points, find amplitude/period/phase shift, reason about concavity and rates of change. |
| FRQ 4 | Symbolic Manipulations | 6 | No (Part B) | Exponential, logarithmic, trig, or inverse trig. Solve equations, rewrite expressions in equivalent forms, find exact values without a calculator. |

*Note: The College Board fixes the four FRQ archetypes (Function Concepts, Non-Periodic Modeling, Periodic Modeling, Symbolic Manipulations) — only the specific functions and contexts rotate year to year. Two FRQs are calculator-active (Part A, 30 minutes) and two are no-calculator (Part B, 30 minutes). Each is worth 6 points and weighted equally.*

**Unit Weighting and Topic Focus**

| Unit | Topic Focus | Exam Weight |
|---|---|---|
| Unit 1: Polynomial and Rational Functions | Rates of change, end behavior, zeros, complex roots, transformations, model selection | 30–40% |
| Unit 2: Exponential and Logarithmic Functions | Arithmetic/geometric sequences, exponentials, logarithms, composition, inverses, semi-log plots | 27–40% |

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| Unit | Topic Focus | Exam Weight |
|---|---|---|
| Unit 3: Trigonometric and Polar Functions | Periodic phenomena, sinusoidal modeling, trig equations, polar coordinates, polar graphs | 30–35% |
| Unit 4: Functions Involving Parameters, Vectors, and Matrices | Optional content — parametric functions, conic sections, vectors, matrices | Not assessed |

**How Course Skills Are Assessed**

| Skill Category | Skill | Exam Weighting | Description |
|---|---|---|---|
| Practice 1: Procedural and Symbolic Fluency | 1.A Solve equations and inequalities | 14–17% | Algebraically solve equations and inequalities, with and without technology. |
| | 1.B Express equivalent forms | 9–13% | Rewrite functions, equations, or expressions in analytically equivalent forms useful in a given context. |
| | 1.C Construct new functions | 15–19% | Build new functions using transformations, compositions, inverses, or regressions. |
| Practice 2: Multiple Representations | 2.A Identify information from representations | 14–17% | Pull information from graphical, numerical, analytical, and verbal representations. |
| | 2.B Construct equivalent representations | 6–9% | Translate between graphical, numerical, analytical, and verbal forms. |
| Practice 3: Communication and Reasoning | 3.A Describe characteristics | 10–14% | Describe a function with varying levels of precision based on the representation. |
| | 3.B Apply numerical results | 9–13% | Apply numerical results in a given mathematical or applied context. |
| | 3.C Support conclusions | 13% | Support conclusions or choices with a logical rationale or appropriate data. |

### Mathematical Practices Assessed

- Mathematical Practice 1: Procedural and Symbolic Fluency — algebraically manipulate functions, equations, and expressions.
- Mathematical Practice 2: Multiple Representations — translate mathematical information between graphical, numerical, analytical, and verbal forms.
- Mathematical Practice 3: Communication and Reasoning — communicate with precise language and provide rationales for conclusions.

### Common Task Verbs in Free-Response Questions

| Task Verb | Definition |
|---|---|
| Construct / Write a function, expression, equation, or model | Develop an analytical representation, with and without technology, that is consistent with a scenario, data set, or other criteria. |
| Describe | Develop a verbal representation that is consistent with a scenario, data set, function representation, or other criteria. |
| Determine / Find / Identify | Apply appropriate methods or processes for answering a question. |
| Estimate / Compare | Use a function representation to find approximate values and/or compare results. |
| Explain / Give a reason / Provide a rationale / Justify | Use information from the scenario or function representation to provide reasons or rationales for solutions or conclusions. |
| Express / Indicate | Provide information or a result in a desired form or include units as part of the answer to a question. |
| Interpret | Describe the connection between a mathematical expression or solution and its meaning within the realistic context of a problem, often including consideration of units. |
| Plot and label / Sketch and label | Develop a graphical representation that is consistent with a scenario, data set, or other criteria. |
| Rewrite | Apply appropriate methods to determine equivalent analytical representations of an expression. |
| Solve | Apply appropriate methods to determine solutions to an equation or inequality. |

## 📚 Unit-by-Unit Review

A condensed walkthrough of every assessed unit on the AP Precalculus exam, drawn directly from the College Board Course and Exam Description (Effective Fall 2023). Use this section to spot-check your weakest units — the percentages reflect MCQ weighting. Unit 4 is not assessed on the AP Exam.

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## Unit 1: Polynomial and Rational Functions (30–40% of MCQ)

Unit 1 builds the foundation of the course: covariation between two quantities, average and instantaneous rates of change, and how those ideas play out for polynomial and rational functions. You'll classify end behavior, find real and complex zeros, locate vertical asymptotes and holes, and use transformations to shift, dilate, or reflect parent functions. The unit closes with model selection — choosing whether a linear, quadratic, polynomial, or rational function fits a given context, and articulating the assumptions and limitations of that choice. The biggest student trip-ups are confusing zeros with vertical asymptotes (rational functions have both), forgetting that complex zeros come in conjugate pairs, and mis-ordering transformations when multiple are applied.

*Topics covered:*

1.1 Change in Tandem
1.2 Rates of Change
1.3 Rates of Change in Linear and Quadratic Functions
1.4 Polynomial Functions and Rates of Change
1.5 Polynomial Functions and Complex Zeros
1.6 Polynomial Functions and End Behavior
1.7 Rational Functions and End Behavior
1.8 Rational Functions and Zeros
1.9 Rational Functions and Vertical Asymptotes
1.10 Rational Functions and Holes
1.11 Equivalent Representations of Polynomial and Rational Expressions
1.12 Transformations of Functions
1.13 Function Model Selection and Assumption Articulation
1.14 Function Model Construction and Application

## Unit 2: Exponential and Logarithmic Functions (27–40% of MCQ)

Unit 2 takes the rate-of-change lens from Unit 1 and applies it to functions whose rates of change are themselves changing — arithmetic and geometric sequences, exponential growth and decay, and their logarithmic inverses. You'll manipulate exponential and logarithmic expressions using properties of exponents and logs, build composite and inverse functions, and use semi-log plots to linearize exponential data. Modeling tasks require validating one model against a competing one. The classic mistakes are misapplying log properties ($\log(a + b) \neq \log a + \log b$), forgetting to check for extraneous solutions in logarithmic equations, and not recognizing when a context calls for an exponential model instead of a polynomial one.

*Topics covered:*

2.1 Change in Arithmetic and Geometric Sequences
2.2 Change in Linear and Exponential Functions
2.3 Exponential Functions
2.4 Exponential Function Manipulation
2.5 Exponential Function Context and Data Modeling
2.6 Competing Function Model Validation

2.7 Composition of Functions
2.8 Inverse Functions
2.9 Logarithmic Expressions
2.10 Inverses of Exponential Functions
2.11 Logarithmic Functions
2.12 Logarithmic Function Manipulation
2.13 Exponential and Logarithmic Equations and Inequalities
2.14 Logarithmic Function Context and Data Modeling
2.15 Semi-log Plots

**Unit 3: Trigonometric and Polar Functions (30–35% of MCQ)**

Unit 3 is the largest single unit on the exam — and the most distinctive. You'll move from the unit-circle definitions of sine, cosine, and tangent into sinusoidal modeling, where amplitude, period, phase shift, and vertical shift describe periodic real-world phenomena. The unit covers inverse trig functions and their domain restrictions, trigonometric equations and identities, and the reciprocal functions (secant, cosecant, cotangent). It ends with a polar coordinate chunk: converting between rectangular and polar forms, graphing polar curves, and analyzing rates of change in polar functions. Students get burned by calculator mode (the AP Exam requires radians), by skipping the domain check on inverse trig, and by drawing polar graphs without thinking about how r changes as θ rotates.

*Topics covered:*

3.1 Periodic Phenomena
3.2 Sine, Cosine, and Tangent
3.3 Sine and Cosine Function Values
3.4 Sine and Cosine Function Graphs
3.5 Sinusoidal Functions
3.6 Sinusoidal Function Transformations
3.7 Sinusoidal Function Context and Data Modeling
3.8 The Tangent Function
3.9 Inverse Trigonometric Functions
3.10 Trigonometric Equations and Inequalities
3.11 The Secant, Cosecant, and Cotangent Functions
3.12 Equivalent Representations of Trigonometric Functions
3.13 Trigonometry and Polar Coordinates
3.14 Polar Function Graphs
3.15 Rates of Change in Polar Functions

## 🆘 AP Precalculus Resources

That’s all from me today! If you liked this guide and want more, shoot me a ✏️ in my DMs!

**MahadtheMentor Road to a 5: AP Precalculus**

| Helpful Videos | Helpful Websites |
|---|---|
| The Algebros<br>Tutoring MaPhy<br>Katherine Quigley<br>Karie E Kosh<br>Flipped Math (YouTube) | Flipped Math<br>Past FRQs (College Board)<br>Fiveable AP Precalc Library<br>Knowt AP Precalculus Notes<br>r/APStudents Subreddit |