

AP Calculus AB FRQ Practice: Four Original Teaching Tasks

Question booklet / four original teaching tasks

Write a complete solution before revealing the worked reasoning. These four independently authored teaching tasks connect sampled data, implicit differentiation, differential equations and an accumulated function. Use the checklists to inspect your methods, conditions and communication, not to calculate an official AP score.

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Scope and review status

Selected AB-level practice for the 2026–27 course. This four-task resource is not a complete six-question exam, an official College Board paper, an official rubric or a validated scoring simulation. Classroom time estimates are editorial. The linked official released questions and scoring guidelines are separate study references.

Author calculations and source-version checks are recorded separately. Independent agent review is distinct from qualified AP educator review. Self-assessment items are local learning criteria, not official marks.

Independent content review: peer checked. Qualified educator review: pending.

This is an original study resource, not an official examination, endorsement, score prediction or certification.

<https://openexam.site/exams/ap-calculus-ab/frq/>

Write, check, and revise

Attempt one task on paper before opening its solutions. Label every subpart, show the setup, and give the reason for each conclusion. A numerical answer alone may hide a missing hypothesis or a sign error.

Use the question-only PDF for a clean attempt, and the separate solution PDF for worked reasoning and self-assessment. These downloads contain the same original tasks as this page.

- Keep approximate results distinct from exact results.
- Name the theorem and verify its conditions when a justification is requested.
- State units in contextual rate and accumulation answers.
- Treat each self-assessment statement as a learning check, not as an official point or AP score.

Four goals and their prerequisites

The tasks emphasize different mathematical decisions. Table values support estimates and a theorem argument; an implicit equation supports tangent and related-rate reasoning; an initial value selects a differential-equation solution; graph vertices support FTC and sign analysis.

Task	Main goal	Suggested time
1	Sampled rates, net accumulation and MVT	18 minutes
2	Implicit derivatives, tangent behavior and related rates	20 minutes
3	Separation, initial values and a justified estimate	18 minutes
4	Read a derivative graph through an accumulation function	18 minutes

How this practice relates to the current exam

The current official exam page lists six free-response questions in 90 minutes: two calculator-required questions in 30 minutes and four calculator-not-permitted questions in 60 minutes. The 2026–27 clarifications do not add new AB course content; the announced May 2027 question-count changes concern multiple choice.

This resource deliberately contains only four teaching tasks. Its practice calculator instructions and suggested times do not recreate a complete official section. The linked released 2026 paper and its scoring guidelines retain their own version-specific instructions.

Continue with official released material

After revising these tasks, open the official released-question index and choose a released paper. Use that paper's own calculator directions and published scoring guidelines. Compare whether your written work establishes the requested setup, reason and interpretation rather than copying an answer.

The numerical data, functions, graph vertices, prompts and local checklists below were authored for this resource. No College Board question or official point table is reproduced, and no qualified educator approval is claimed.

Task 1 — A reservoir observed at uneven times

Topic: Sampled rates, trapezoidal accumulation, net change and the Mean Value Theorem / Suggested time: 18 minutes

Calculator policy: Practice instruction: calculator optional for arithmetic; show the quotient, trapezoidal setup and integral model. These are not official section-placement instructions.

A reservoir contains 60 liters at time $t = 0$. Water enters at a nonnegative rate $R(t)$, in liters per minute, and leaves at the constant rate 4 liters per minute for $0 \leq t \leq 8$. The reservoir has enough capacity for this model. Assume R is continuous on $[0, 8]$ and differentiable on $(0, 8)$. Only the table values of R are known; do not assume linear interpolation. Let $V(t)$ be the amount of water, in liters.

t (minutes)	$R(t)$ (liters/minute)
0	3
2	7
5	5
8	1

Original sampled-rate table. Values between sample times are not specified.

Part a

Estimate $R'(7/2)$ using the average rate of change on $[2, 5]$. Include units and interpret the sign.

Show your method and justify the conclusion. Use the space below.

Part b

Use trapezoids on $[0, 2]$, $[2, 5]$ and $[5, 8]$ to estimate $\int_0^8 R(t) dt$. Explain what this integral measures.

Show your method and justify the conclusion. Use the space below.

Task 1 — A reservoir observed at uneven times

Part c

Write an exact integral expression for $\bar{V}(8)$, then estimate $\bar{V}(8)$ using part (b).

Show your method and justify the conclusion. Use the space below.

Part d

Prove that some $c \in (2, 5)$ satisfies $R'(c) = -2/3$. Does this prove that $R'(7/2) = -2/3$ exactly? Explain.

Show your method and justify the conclusion. Use the space below.

Task 2 — A positive branch of an implicit constraint

Topic: Implicit derivatives, tangent approximation, concavity and related rates / Suggested time: 20 minutes

Calculator policy: Practice instruction: no calculator is needed. Keep exact fractions; show implicit differentiation before substituting the point.

Consider the curve $2x^2 + xy + 3y^2 = 13$ and its positive, twice-differentiable branch through $(2, 1)$. This branch remains positive for $2 \leq x \leq 21/10$. Parts(a)–(c) use dimensionless coordinates; part (d) introduces a separate length-and-time model with the same algebraic constraint.

Part a

Find dy/dx in terms of x and y . Then find the tangent-line equation at $(2, 1)$.

Show your method and justify the conclusion. Use the space below.

Part b

Find d^2y/dx^2 at $(2, 1)$. Justify the sign of the result.

Show your method and justify the conclusion. Use the space below.

Part c

Use the tangent line to estimate y at $x = 21/10$. Is the tangent estimate above or below the actual branch value? Justify the comparison throughout $[2, 21/10]$, not just by giving the sign at one point.

Show your method and justify the conclusion. Use the space below.

Part d

In a separate model, x and y are positive lengths in centimeters that depend on time s , in seconds, and satisfy the same constraint (with constant 13 square centimeters). At the instant $x = 2, y = 1$ and $dx/ds = 4$ centimeters per second, find dy/ds . Interpret the sign.

Show your method and justify the conclusion. Use the space below.

Task 3 — Select and test a differential-equation solution

Topic: Separation of variables, initial conditions, concavity and a unique threshold / Suggested time: 18 minutes

Calculator policy: Practice instruction: exact work requires no calculator. A calculator may be used only to report the optional three-decimal value in part (d).

A positive function y satisfies $dy/dx = (2x + 1)/(2y)$ for $0 \leq x \leq 2$, with $y(0) = 2$. The variables in this task are dimensionless. Write supporting differentiation or integration steps, not just a candidate formula.

Part a

Find $y'(0)$, write the tangent line at $x = 0$, and use it to estimate $y(1/5)$.

Show your method and justify the conclusion. Use the space below.

Part b

Use separation of variables to find the particular solution. Explain how the sign of the square root is determined, and verify the differential equation and initial condition.

Show your method and justify the conclusion. Use the space below.

Part c

Use the particular solution to prove that the tangent estimate in part (a) is an underestimate.

Show your method and justify the conclusion. Use the space below.

Part d

Find the first $x \in [0, 2]$ for which $y(x) = 3$. Give an exact answer; an optional decimal should be rounded to three places.

Show your method and justify the conclusion. Use the space below.

Task 4 — Recover behavior from a graph of a rate

Topic: FTC, signed geometric area, local extrema and absolute extrema / Suggested time: 18 minutes

Calculator policy: Practice instruction: no calculator is needed. Use signed areas of triangles, trapezoids and rectangles and show the endpoint comparisons.

A continuous function h on $[-2, 6]$ has a graph consisting exactly of straight-line segments joining consecutive vertices in the table. The table is an original exact description of the graph, not a collection of unspecified samples. Define $G(x) = -2 + \int_0^x h(t) dt$. All coordinates and function values in this task are dimensionless.

x-coordinate	$h(x)$ at a graph vertex
-2	1
0	-1
2	-1
4	3
6	1

Original polygonal graph represented by its vertices. Join consecutive rows by straight segments; between $x=0$ and $x=2$ the graph is horizontal.

Part a

Find $G'(3)$ and $G''(3)$. Explain how each value is read from the given graph.

Show your method and justify the conclusion. Use the space below.

Part b

Compute $G(4)$ using signed areas.

Show your method and justify the conclusion. Use the space below.

Task 4 — Recover behavior from a graph of a rate

Part c

Find every interior local maximum and local minimum of G . Give the x -values and justify each classification.

Show your method and justify the conclusion. Use the space below.

Part d

Find the absolute maximum and absolute minimum values of G on $[-2, 6]$, and where they occur. Justify why the candidate list is complete.

Show your method and justify the conclusion. Use the space below.

REFERENCE TRAIL

Sources, version and scope

The linked materials are references for the independently authored explanation and task design. Public access does not imply permission to reproduce an official examination bank.

AP Calculus AB course and current content framework

<https://apcentral.collegeboard.org/courses/ap-calculus-ab>

Reference version: 2026–27 course page, reviewed 2026-10-28

Locator: Course Content and Mathematical Practices; eight-unit AB framework.

AP Calculus AB exam overview

<https://apcentral.collegeboard.org/courses/ap-calculus-ab/exam>

Reference version: Current 2026–27 page / May 2027 exam, reviewed 2026-10-28

Locator: Clarifications and Exam Updates for 2026–27; SectionII:Free Response.

AP Calculus AB and BC Course and Exam Description

<https://apcentral.collegeboard.org/media/pdf/ap-calculus-ab-and-bc-course-and-exam-description.pdf>

Reference version: CED linked by the current 2026–27 course page; retained 2026-10-28

Locator: Topics 3.2,3.6,4.4–4.6,5.1–5.6,6.2,6.4–6.5, and 7.6–7.7. Relevant PDF pages 76,80,90–92,99–104,119,121–122,142–143.

AP Calculus AB and BC CED clarifications and corrections

<https://apcentral.collegeboard.org/media/pdf/ap-calculus-ab-bc-course-and-exam-description-clarifications.pdf>

Reference version: Effective Fall 2026

Locator: PDF pages 1–2:EVT clarification, FUN-7. B.2, and May 2027 MCQ changes.

Official AP Calculus AB released FRQs and scoring resources

<https://apcentral.collegeboard.org/courses/ap-calculus-ab/exam/past-exam-questions>

Reference version: Current public index, reviewed 2026-10-28

Locator: 2026 released FRQ and Scoring Guidelines links.

2026 AP Calculus AB released free-response questions

<https://apcentral.collegeboard.org/media/pdf/ap26-frq-calculus-ab.pdf>

Reference version: 2026 released examination

Locator: PDF pages 2 and 6:calculator/noncalculator directions and written-justification instructions. Questions are linked for separate practice, not reproduced here.

2026 AP Calculus AB released scoring guidelines

<https://apcentral.collegeboard.org/media/pdf/ap26-sg-calculus-ab.pdf>

Reference version: 2026 released scoring guidelines

Locator: PDF page 2:general scoring notes and setup/units distinction; question-specific notes illustrate that criteria are tied to actual official prompts. No official point scheme is assigned to these new tasks.