

AP Calculus AB Foundation Worksheet

8 original questions, working space and separate answer explanations. Version 2026-10-27.

Scope

Calculus AB foundation practice.

This is an untimed foundation study sample, not an official examination or complete mock test. Author-reviewed learning materials; independent educator review and learner calibration remain pending.

How to use this worksheet

Work through the questions before opening the answer section. Write your calculation or the reason for your choice. After checking the explanation, return to the linked lesson for any unfamiliar distinction.

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

QUESTION 1 / Limits without guessing

Find the limit as x approaches 3 of $2x^2 + 4$.

- A. 10
- B. 22
- C. 18
- D. 98

Working / reasoning:

Item ab-limits-1-1 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/limits/>

QUESTION 2 / Derivative rules and meaning

If $f(x)=3x^3+5$, find $f'(4)$.

- A. 144
- B. 48
- C. 36
- D. 149

Working / reasoning:

Item ab-derivatives-1-2 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/derivatives/>

QUESTION 3 / Position, velocity and acceleration

An object has position $s(t)=4t^2+6t$ meters. Find its velocity at $t=5$ seconds.

- A. 40
- B. 46
- C. 26
- D. 130

Working / reasoning:

Item ab-motion-1-3 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/motion/>

QUESTION 4 / Integrals and numerical accumulation

An antiderivative of $5x^6$ is kx^7+C . Find k .

Your answer: _____

Working / reasoning:

Item ab-integration-1-4 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/integration/>

QUESTION 5 / Differential equations and initial values

A solution satisfies $dy/dx=x+y$. What is its slope at $(2,3)$?

- A. 5
- B. 6
- C. 2
- D. 3

Working / reasoning:

Item ab-differential-equations-1-1 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/differential-equations/>

QUESTION 6 / Area, average value and volume

Find the area between $y=5x$ and $y=0$ from $x=0$ to $x=6$.

Your answer: _____

Working / reasoning:

Item ab-integral-applications-1-4 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/integral-applications/>

QUESTION 7 / Choose and justify a theorem

f is continuous on $[0,4]$ and differentiable on $(0,4)$, with $-5 \leq f'(x) \leq 8$. If $f(0)=8$, what is the smallest value $f(4)$ could have under these constraints?

- A. 40
- B. 3
- C. -12
- D. 28

Working / reasoning:

Item ab2-mvt-rate-bound-v3 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/theorem-decisions/>

QUESTION 8 / Areas across intersections and sideways slices

Find the total area between $y=x^2$ and $y=36$ for $0 \leq x \leq 12$.

Your answer: _____

Working / reasoning:

Item ab2-crossing-area-v4 | Lesson: <https://openexam.site/exams/ap-calculus-ab/learn/area-geometry/>

AP Calculus AB: Answers & Explanations

Compare the method or rule as well as the final answer. These explanations are study aids, not official scoring guidance.

QUESTION 1 / ab-limits-1-1

Answer: 22

1. The polynomial is continuous at 3.
2. Substitute $x=3$: $2(3)^2+4$.
3. The limit is 22.

QUESTION 2 / ab-derivatives-1-2

Answer: 144

1. The power rule gives $f'(x)=9x^2$.
2. The constant term differentiates to zero.
3. Substitute 4: $f'(4)=144$.

QUESTION 3 / ab-motion-1-3

Answer: 46

1. Velocity is $s'(t)=8t+6$.
2. Evaluate at $t=5$.
3. The velocity is 46 meters per second.

QUESTION 4 / ab-integration-1-4

Answer: $5/7$

1. Differentiate kx^7 to obtain $(7)kx^6$.
2. Match its coefficient to 5.
3. Thus $k=5/7$.

QUESTION 5 / ab-differential-equations-1-1

Answer: 5

1. A slope field evaluates the differential equation at the specified point.
2. Substitute $x=2$, $y=3$.
3. The slope is 5.

QUESTION 6 / ab-integral-applications-1-4

Answer: 90

1. The upper function is the line throughout this nonnegative interval.
2. Integrate $5x$ from 0 to 6.
3. The area is 90 square units.

QUESTION 7 / ab2-mvt-rate-bound-v3

Answer: -12

1. The Mean Value Theorem expresses the total change as an interior derivative times interval length.
2. The smallest allowed change is $-5 \times 4 = -20$.
3. Add the initial value to obtain -12. The line $f(x) = 8 - 5x$ attains this bound.

QUESTION 8 / ab2-crossing-area-v4

Answer: 432

1. The curves cross at $x=6$ in the interval; the horizontal line is above before that point.
2. Integrate $(36-x^2)$ on $[0,6]$ and (x^2-36) on $[6,12]$.
3. The pieces are 144 and 288; the total is 432.

References and scope notes

The questions and teaching explanations are original catalog materials. References support the selected concepts; they are not endorsements or a reproduced official examination bank.

AP Calculus AB course

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

Calculus Volume 1: Fundamental Theorem of Calculus

<https://openstax.org/books/calculus-volume-1/pages/5-3-the-fundamental-theorem-of-calculus>

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>

Foundation pilot: 400 parameterized original questions across 96 task families, not 400 independently designed scenarios.

54 original written extensions use self-assessment criteria; they are not official AP tasks or rubric scores.

Coverage remains partial: sustained calculator investigations, comprehensive slope-field interpretation and every official subtopic require additional study.

Difficulty is editorial and uncalibrated. Independent educator review and learner testing remain pending.

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