

AP Calculus AB · Limits and Continuity · Quiz

Common Core AP Calculus AB Unit 1 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This ap calculus limits quiz asks 10 multiple-choice questions on limits and continuity, and each answer comes with a short explanation.

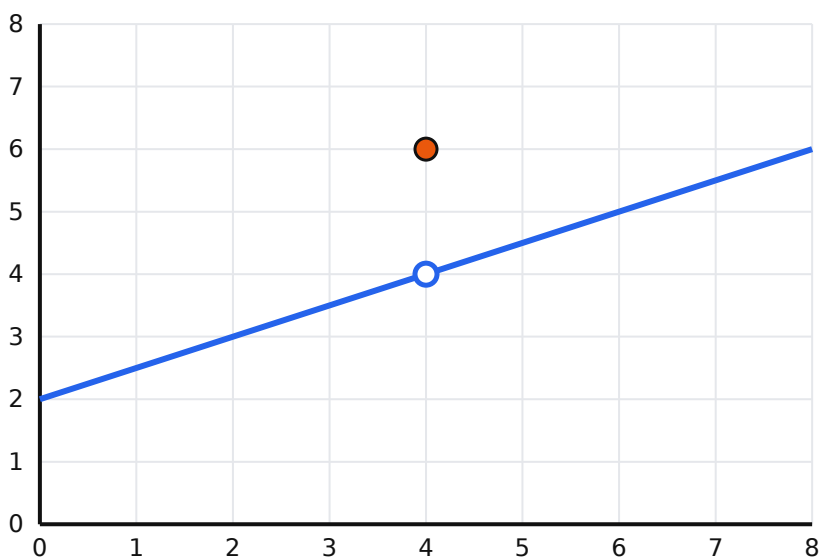
This 10-question multiple choice quiz checks limits from graphs, algebraic limits, limits at infinity, continuity and the Intermediate Value Theorem. Pick the one correct answer for each question, then read the explanation to learn from any miss.

AP Calculus ABCommon Core: AP Calculus AB Unit 1

Questions

Question 1

Use the graph of g to find $\lim_{x \rightarrow 4} g(x)$.



Graph for question 1.

- A. 4
- B. 6
- C. 2
- D. The limit does not exist

Question 2

Evaluate $\lim_{x \rightarrow 4} \frac{x^2 - 3x - 4}{x - 4}$.

- A. 0
- B. -5
- C. 5
- D. The limit does not exist

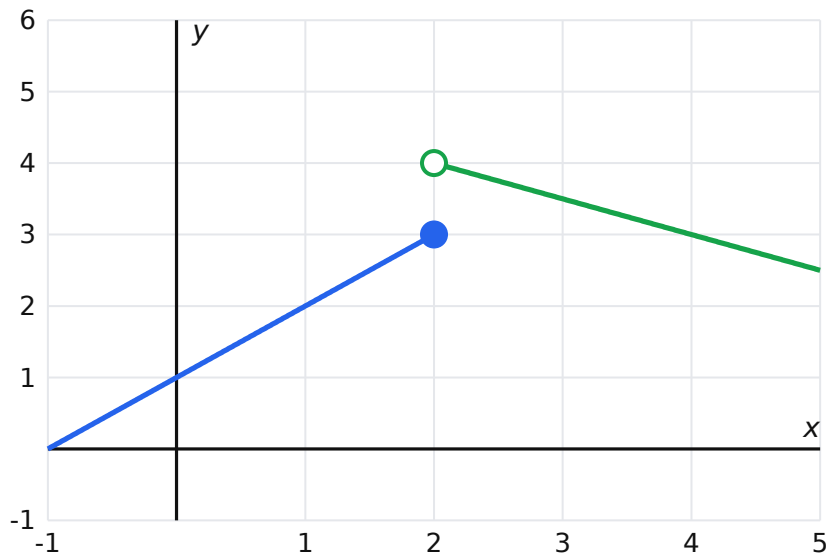
Question 3

Evaluate $\lim_{x \rightarrow \infty} \frac{5x^2 + 3}{2x^2 - x}$.

- A. 5
- B. 0
- C. ∞
- D. $\frac{5}{2}$

Question 4

The graph of a function is shown. What kind of discontinuity occurs at $x = 2$?



Graph for question 4.

- A. Removable
- B. Jump
- C. Infinite
- D. There is no discontinuity

Question 5

Evaluate $\lim_{x \rightarrow 0} \frac{\sin 3x}{x}$.

- A. 1

- B. 3
- C. 0
- D. $\frac{1}{3}$

Question 6

Let $f(x) = kx + 2$ when $x \leq 2$ and $f(x) = x^2 + k$ when $x > 2$. For what value of k is f continuous at $x = 2$?

- A. $k = 1$
- B. $k = 0$
- C. $k = 4$
- D. $k = 2$

Question 7

A function f is continuous on $[2, 6]$ with $f(2) = 4$ and $f(6) = -8$. Which statement must be true?

- A. $f(c) = -11$ for some c in $(2, 6)$
- B. f is decreasing on $[2, 6]$
- C. $f(c) = 0$ for exactly one c in $(2, 6)$
- D. $f(c) = -1$ for some c in $(2, 6)$

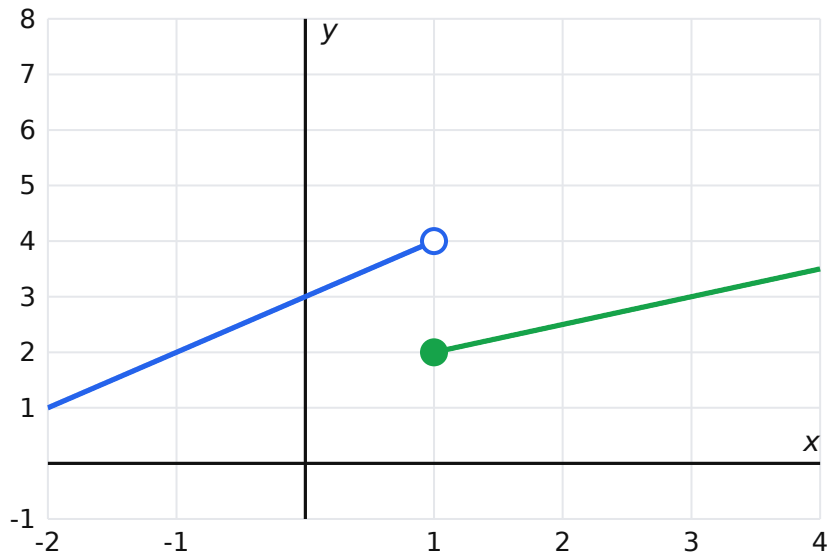
Question 8

Which line is a horizontal asymptote of $f(x) = \frac{3x^2 + 1}{x^2 - 4}$?

- A. $y = 3$
- B. $y = 0$
- C. $x = 2$
- D. $y = -\frac{1}{4}$

Question 9

The graph of f is shown. What is $\lim_{x \rightarrow 1} f(x)$?



Graph for question 9.

- A. 2
- B. 4
- C. The limit does not exist
- D. 3

Question 10

Which function has a removable discontinuity at $x = 3$?

- A. $\frac{1}{x-3}$
- B. $\frac{x^2-9}{x-3}$
- C. $\frac{x-3}{|x-3|}$
- D. $\frac{x-3}{x^2+3}$

Answer key

1. **A** – Both sides approach height 4, the open circle. The filled point at height 6 is $g(4)$, and the value at the point does not change the limit.
2. **C** – Factor the numerator: $\frac{(x-4)(x+1)}{x-4} = x+1$, which tends to 5. The form $\frac{0}{0}$ is not the answer; it only signals that more work is needed.
3. **D** – Equal degrees give the ratio of leading coefficients, $\frac{5}{2}$. Answering ∞ treats the powers as if the degrees differed.
4. **B** – The left limit is 3 and the right limit is 4. They are unequal and both finite, which is a jump. A hole needs equal one-sided limits.
5. **B** – $\frac{\sin 3x}{x} = 3 \cdot \frac{\sin 3x}{3x} \rightarrow 3 \cdot 1$. Answering 1 forgets the factor of 3.
6. **D** – Set $2k+2=4+k$, so $k=2$. Both sides then equal 6.
7. **D** – The value -1 lies between -8 and 4 , so the Intermediate Value Theorem applies. It never gives monotonicity or uniqueness, and -11 is outside the range.
8. **A** – Equal degrees give $y = \frac{3}{1} = 3$. The line $x=2$ is a vertical asymptote, and $-\frac{1}{4}$ is the value of $f(0)$.
9. **C** – The left limit is 4 and the right limit is 2. They differ, so there is no limit. Averaging them to get 3 is a common mistake.
10. **B** – Only $\frac{(x-3)(x+3)}{x-3}$ has a limit (equal to 6) with an undefined value. $\frac{1}{x-3}$ is infinite, $\frac{|x-3|}{x-3}$ jumps from -1 to 1 , and the last is continuous everywhere.

How does this quiz work?

Read each question, choose one answer among A, B, C and D, then check it: a short explanation appears after every answer. Your score out of 10 is shown at the end, and you can restart the quiz as often as you like.

What should you review before the quiz?

Reread the key facts of the lesson and the worked example. If a question is hard, go back to the matching part of the lesson, then try the quiz again. Write your work on scrap paper: most mistakes come from skipping a step, not from the idea itself.

Remember:

- AP Calculus AB Unit 1: $\lim_{x \rightarrow a} f(x) = L$ means $f(x)$ gets arbitrarily close to L as x gets close to a , from both sides.
- The two-sided limit exists only when $\lim_{x \rightarrow a^-} f(x) = \lim_{x \rightarrow a^+} f(x)$.
- Continuity at $x = a$ needs three things: $f(a)$ is defined, $\lim_{x \rightarrow a} f(x)$ exists, and the two are equal.
- Discontinuities come in three kinds: removable (hole), jump, and infinite (vertical asymptote).

- The Intermediate Value Theorem: if f is continuous on $[a, b]$ and k lies between $f(a)$ and $f(b)$, then $f(c) = k$ for some c in (a, b) .

How to use this ap calculus limits quiz

Retake this ap calculus limits quiz until every answer is right, then move on to the worksheet and the test.

