

Limits and Continuity: Approaching a Value

Grade 12 – AP Calculus AB math · Test · Standards: AP Calculus AB Unit 1

Name: _____ Date: _____ Class: _____

This 45-minute test follows the AP Calculus AB style: two multiple-choice questions written out with options, and free-response questions where work must be shown. Calculators are not needed. The total is 20 points, and answers without justification earn partial credit only.

Standards: AP Calculus AB Unit 1 · **Level:** Grade 12 AP Calculus AB

Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Evaluate a limit (2 points)

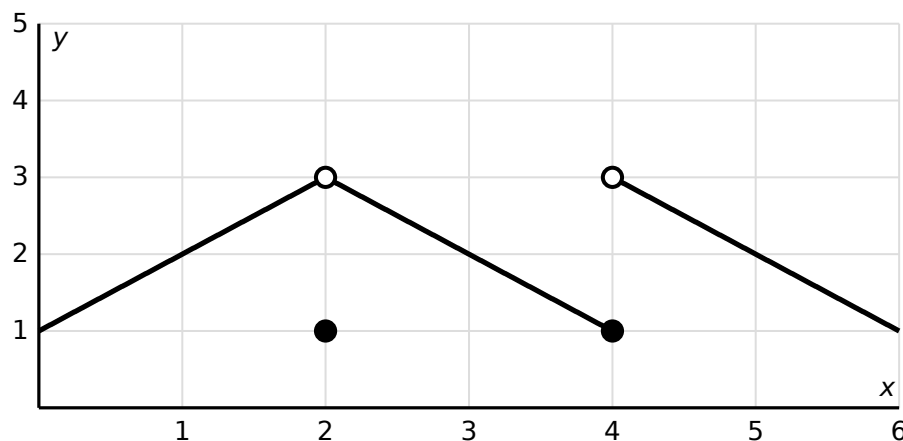
Which value equals $\lim_{x \rightarrow 2} \frac{(x^2 - x - 2)}{(x^2 - 4)}$?

- A. 0
- B. $3/4$
- C. $3/2$
- D. The limit does not exist

Question 2 Reading a graph (3 points)

The graph of k is shown. Find:

- a. $\lim_{x \rightarrow 2} k(x)$ (1 point)
- b. $\lim_{x \rightarrow 4^-} k(x)$, $\lim_{x \rightarrow 4^+} k(x)$ and $k(4)$ (1 point)
- c. Is k continuous at $x = 4$? Justify. (1 point)



Question 3 Limit at infinity (2 points)

Evaluate $\lim_{x \rightarrow \infty} \frac{(7x^3 - x)}{(2 - 5x^3)}$.

- A. $-7/5$
- B. $-7/2$
- C. $7/5$
- D. The limit is ∞

Question 4 Conjugate method (2 points)

Show your work to evaluate $\lim_{x \rightarrow 0} \frac{(\sqrt{x+16}) - 4}{x}$.

Question 5 Continuity at a point (3 points)

Let $f(x) = \frac{(2x^2 - 11x - 6)}{(x - 6)}$ for $x \neq 6$, and $f(6) = 10$.

- a. Find $\lim_{x \rightarrow 6} f(x)$. (1 point)
- b. Is f continuous at $x = 6$? Use the three-part definition. (1 point)
- c. Find the value of $f(6)$ that would make f continuous, and classify the original discontinuity. (1 point)

Question 6 Discontinuities of a rational function (3 points)

Let $f(x) = \frac{(x^2 - x - 6)}{(x^2 - 9)}$.

- a. Find all discontinuities and classify each. (2 points)
- b. Find $\lim_{x \rightarrow -3^-} f(x)$ and $\lim_{x \rightarrow -3^+} f(x)$. (1 point)

Question 7 Intermediate Value Theorem (2 points)

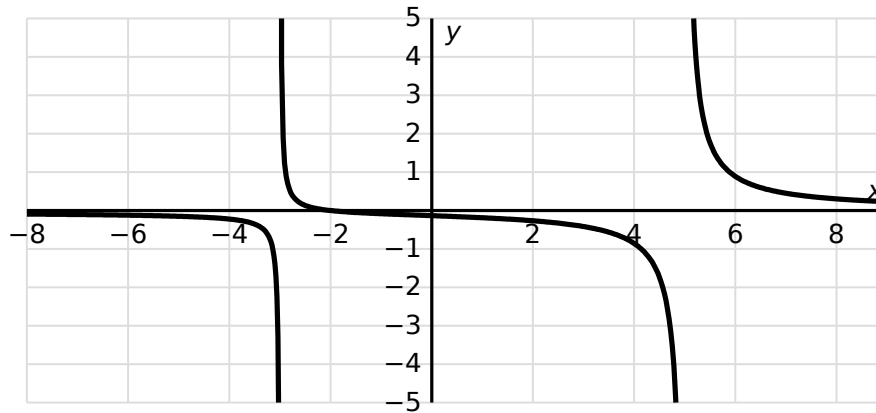
Let $f(x) = x^4 + x - 9$. Explain why $f(x) = 0$ has a solution in $(1, 2)$. Name the theorem and check its hypotheses.

Question 8 Asymptotes and one-sided limits (3 points)

The graph of $f(x) = \frac{(x+2)}{((x-5)(x+3))}$ is shown.

- a. Find $\lim_{x \rightarrow 5^+} f(x)$ and $\lim_{x \rightarrow 5^-} f(x)$. (1 point)

- b. Find $\lim_{x \rightarrow -3^-} f(x)$ and $\lim_{x \rightarrow -3^+} f(x)$. (1 point)
- c. Find the horizontal asymptote and justify. (1 point)



Graph of f .