

AP Calculus AB - Continuity and the Intermediate Value Theorem - Test

Common Core AP CALC AB 1.10, AP CALC AB 1.11, AP CALC AB 1.12, AP CALC AB 1.16 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

This test checks continuity, types of discontinuity, making piecewise functions continuous and the Intermediate Value Theorem (AP Calculus AB, 1.10, 1.11, 1.12, 1.16). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

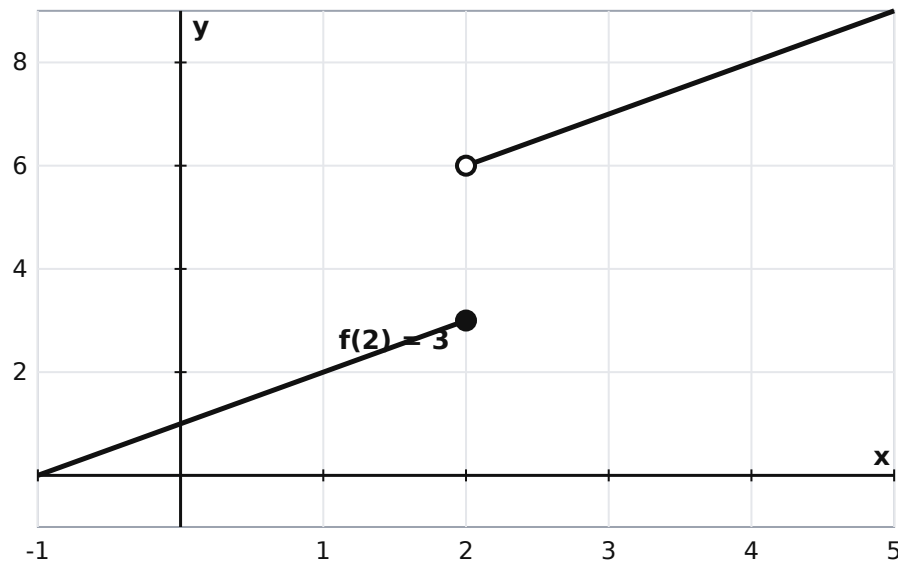
About this test

- Grade: AP Calculus AB
- Chapter: Continuity and the Intermediate Value Theorem
- Standards: AP CALC AB 1.10, AP CALC AB 1.11, AP CALC AB 1.12, AP CALC AB 1.16
- Time: 45 minutes
- Total: 20 points

Question 1 - Three conditions [2 pts]

A function has $f(3)=5$, $\lim_{x \rightarrow 3^-} f(x)=5$ and $\lim_{x \rightarrow 3^+} f(x)=5$. Is f continuous at $x=3$? Justify with the three conditions. A second function g has $\lim_{x \rightarrow 3} g(x)=5$ but $g(3)$ is undefined. Is g continuous at 3?

Question 2 - Classifying discontinuities [2 pts]



Graph of g near $x = 2$.

Classify the discontinuity of g at $x = 2$ in the graph, and then classify $h(x) = \frac{x^2 - 25}{x - 5}$ at $x = 5$.

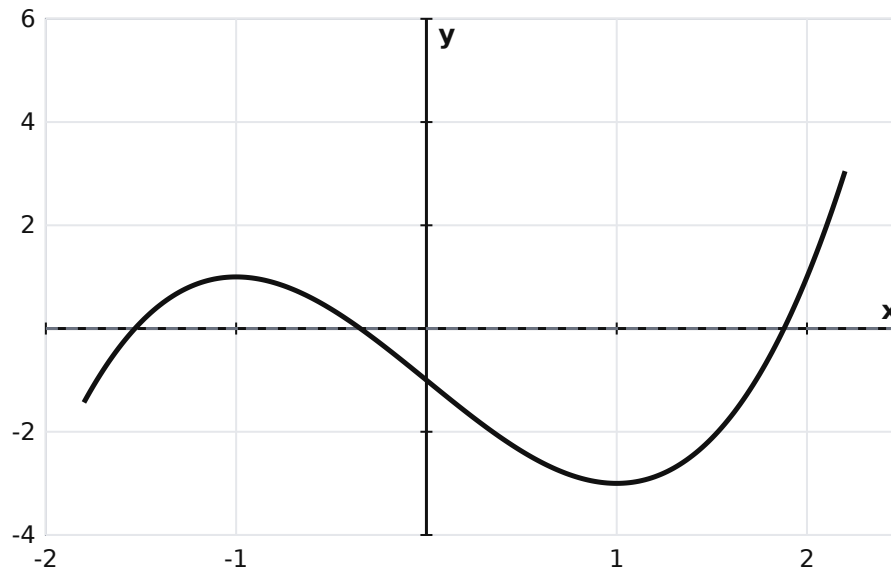
Question 3 - Repairing a function [2 pts]

Let $f(x) = \frac{x^2 - x - 12}{x - 4}$ for $x \neq 4$ and $f(4) = k$. Find k so that f is continuous at $x = 4$.

Question 4 - Continuity at two points [3 pts]

Let $f(x) = 3$ for $x \leq -1$, $f(x) = ax + b$ for $-1 < x < 2$ and $f(x) = 9$ for $x \geq 2$. Find a and b so that f is continuous for all x .

Question 5 - IVT and a root [3 pts]



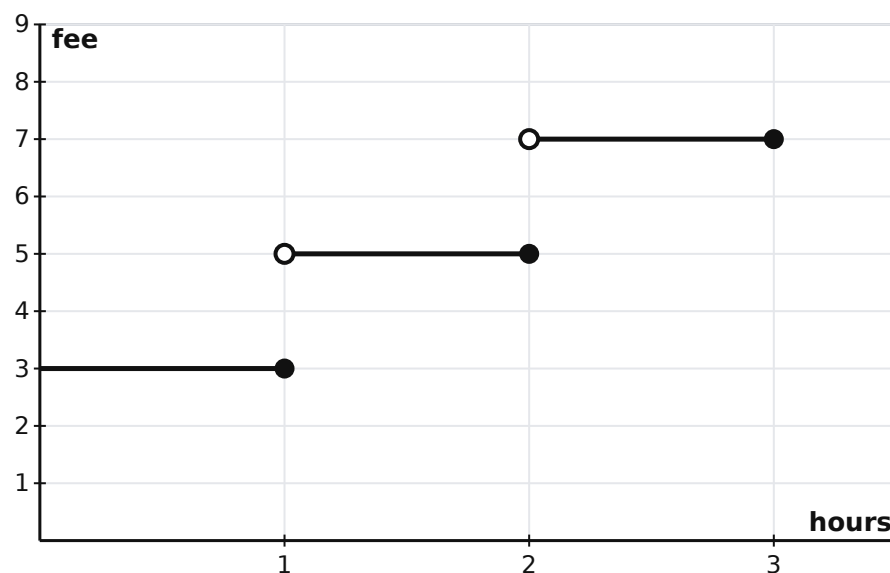
Graph of $f(x) = x^3 - 3x - 1$.

Let $f(x) = x^3 - 3x - 1$. Use the Intermediate Value Theorem to show that f has a zero in $(1, 2)$. Write a complete justification.

Question 6 - IVT guarantees [2 pts]

A function f is continuous on $[0, 6]$ with $f(0) = -4$ and $f(6) = 8$. (a) Is there a c with $f(c) = 5$? (1 point) (b) Is there necessarily a c with $f(c) = 10$? (1 point)

Question 7 - Parking fee steps [3 pts]



Fee in dollars for t hours of parking.

The graph shows the fee $F(t)$ in dollars for t hours of parking. (a) Find $\lim_{t \rightarrow 1^-} F(t)$ and $\lim_{t \rightarrow 1^+} F(t)$. (1 point) (b) Is F continuous at $t=1$? Which type of discontinuity? (1 point) (c) Find all values of t in $(0,3)$ where F is discontinuous. (1 point)

Question 8 - Temperature and the IVT [3 pts]

The temperature $T(t)$ in a greenhouse is continuous. At 6:00 a.m. it is 52°F and at noon it is 81°F . (a) Must the temperature have been exactly 70°F at some time? Justify. (2 points) (b) Can you conclude it reached 90°F ? (1 point)