

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

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/

Use this answer key to score the continuity test out of 20 points. Each solution shows the work and a scoring guide that says how the points are awarded. Give partial credit for a correct setup, a correct derivative or integral, and a correct final statement with units where they apply.

AP Calculus AB · Common Core State Standards: **AP CALC AB 1.10, AP CALC AB 1.11, AP CALC AB 1.12, AP CALC AB 1.16**

Question 1 - Three conditions [2 pts]

$f(3)=5$ is defined; the two one-sided limits are both 5, so the limit exists and equals 5; the limit equals $f(3)$. So **f is continuous**.

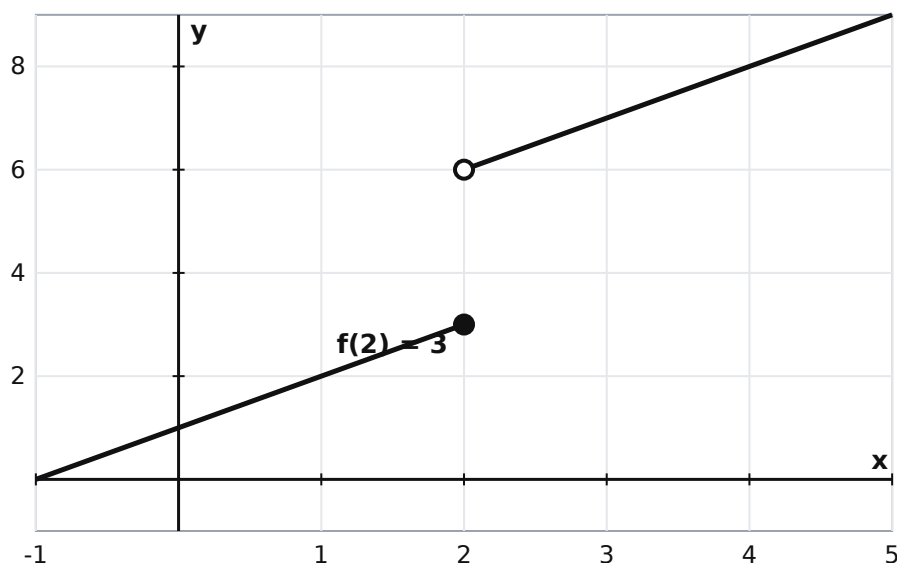
$g(3)$ is undefined, so condition 1 fails: **g is not continuous at 3**.

Scoring: 1 point for f with all three conditions; 1 point for g.

Question 2 - Classifying discontinuities [2 pts]

For g : the one-sided limits are 3 and 6, so it is a **jump discontinuity**.

For h : $\frac{(x-5)(x+5)}{x-5} = x+5$, so the limit is 10 but $h(5)$ is undefined: **removable**.



Graph of g near $x = 2$.

Scoring: 1 point for each classification with a reason.

Question 3 - Repairing a function [2 pts]

$$\frac{(x-4)(x+3)}{x-4} = x+3, \text{ so the limit is } 7.$$

Set $k=7$. Final answer: $k=7$.

Scoring: 1 point for the limit; 1 point for k .

Question 4 - Continuity at two points [3 pts]

At $x = -1$: $-a+b=3$. At $x = 2$: $2a+b=9$.

Subtract: $3a=6$, so $a=2$ and $b=5$.

Final answer: $a=2$, $b=5$.

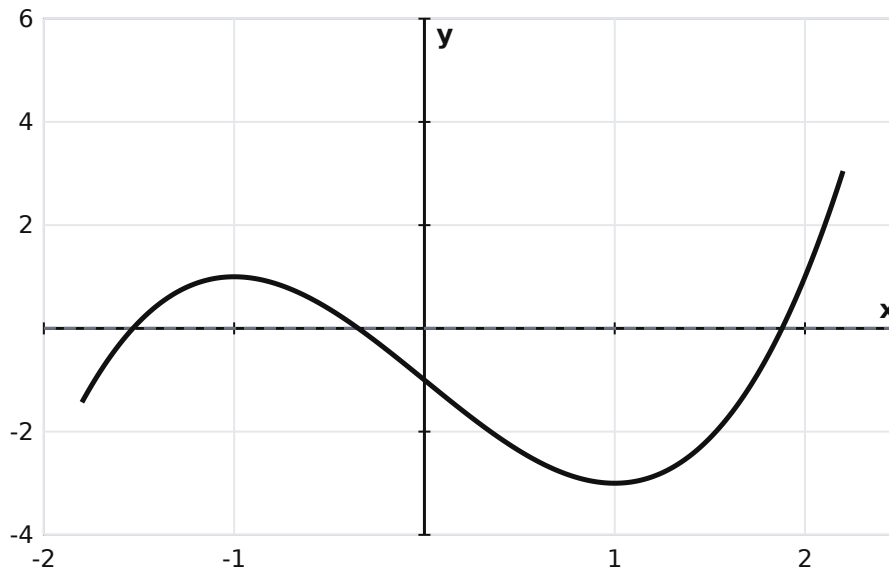
Scoring: 1 point for each equation; 1 point for solving.

Question 5 - IVT and a root [3 pts]

f is a polynomial, so it is continuous on $[1,2]$.

$$f(1)=1-3-1=-3 \text{ and } f(2)=8-6-1=1.$$

Since 0 is between -3 and 1 , the IVT guarantees a c in $(1,2)$ with $f(c)=0$.



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

Scoring: 1 point for continuity; 1 point for both function values; 1 point for the conclusion citing the IVT.

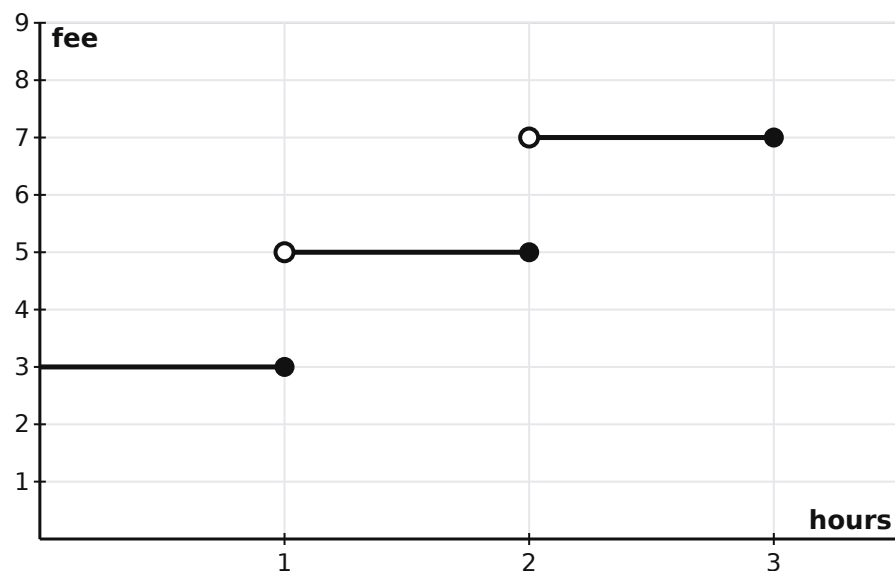
Question 6 - IVT guarantees [2 pts]

- a. **Yes:** 5 is between -4 and 8 and f is continuous.
- b. **No guarantee:** 10 is outside $[-4,8]$.

Scoring: 1 point per part.

Question 7 - Parking fee steps [3 pts]

- a. 3 and 5.
- b. **No;** the one-sided limits differ, so it is a **jump** discontinuity.
- c. $t=1$ **and** $t=2$



Fee in dollars for t hours of parking.

Scoring: 1 point per part.

Question 8 - Temperature and the IVT [3 pts]

- Yes. T is continuous on the time interval, $T(6)=52$ and $T(12)=81$, and 70 is between them. By the IVT, $T(c)=70$ for some c between 6:00 a.m. and noon.
- No. 90 is not between 52 and 81, so the IVT does not apply.

Scoring: (a) 1 point for continuity and endpoint values, 1 point for the conclusion; (b) 1 point.

Total

20 points