

AP Calculus AB - Mean Value Theorem and Extreme Value Theorem - Test

Common Core AP CALC AB 5.1, AP CALC AB 5.2, AP CALC AB 5.3 · maths-pdf.fr/en/

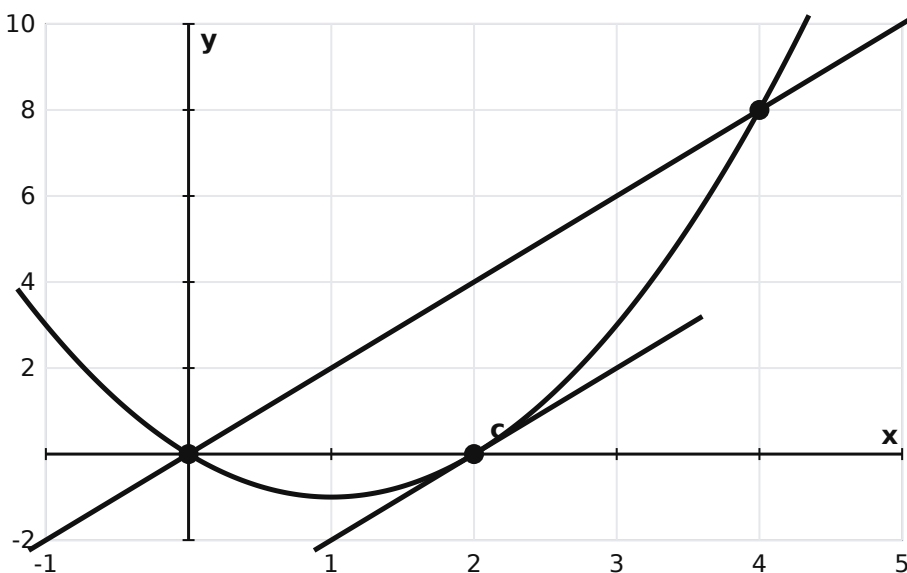
Name: _____ Class: _____ Date: ____/____/____

This test checks the Mean Value Theorem, the Extreme Value Theorem, critical numbers and absolute extrema on closed intervals (AP Calculus AB, 5.1, 5.2, 5.3). 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: Mean Value Theorem and Extreme Value Theorem
- Standards: AP CALC AB 5.1, AP CALC AB 5.2, AP CALC AB 5.3
- Time: 45 minutes
- Total: 20 points

Question 1 - Verify the MVT [3 pts]



Graph of $f(x) = x^2 - 2x$.

Verify that $f(x) = x^2 - 2x$ satisfies the hypotheses of the MVT on $[0, 4]$ and find the value of c .

Question 2 - Hypotheses fail [2 pts]

Explain why the MVT cannot be applied to $f(x) = \frac{1}{x-2}$ on $[1,3]$.

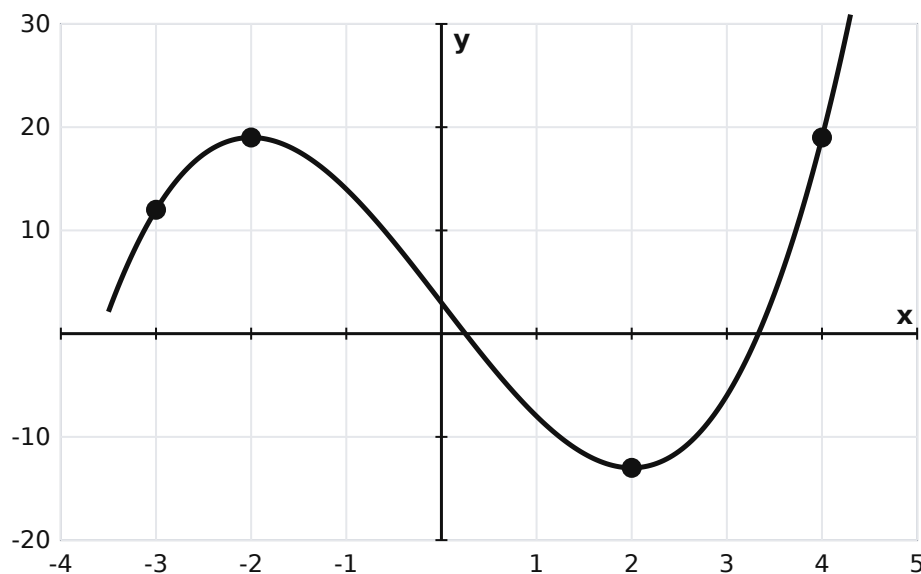
Question 3 - MVT conclusion [2 pts]

A differentiable function has $g(1)=5$ and $g(5)=-3$. Show that $g'(c)=-2$ for some c in $(1,5)$.

Question 4 - Critical numbers [3 pts]

Find all critical numbers of $f(x) = x^4 - 8x^2$ and of $h(x) = (x-1)^{2/3}$.

Question 5 - Absolute extrema [3 pts]



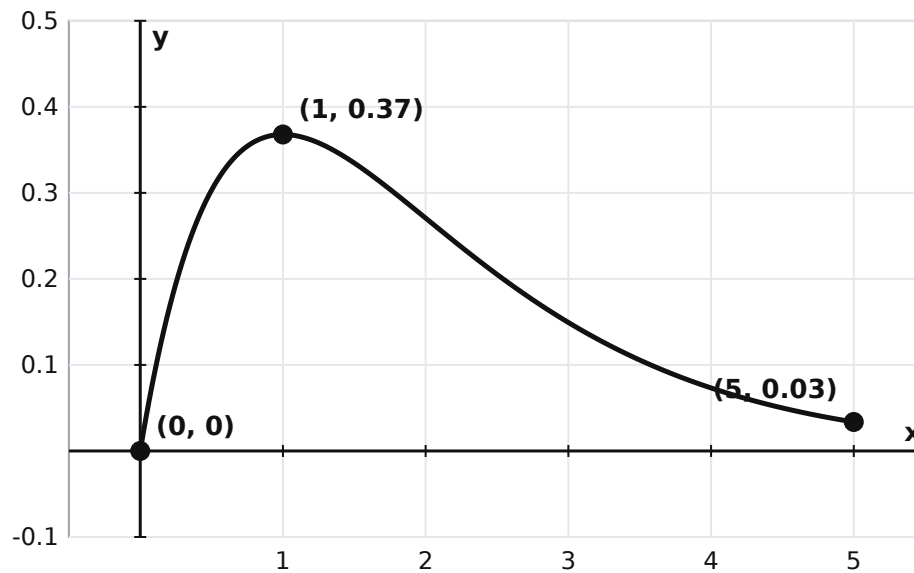
Graph of $f(x) = x^3 - 12x + 3$.

Find the absolute maximum and minimum of $f(x) = x^3 - 12x + 3$ on $[-3,4]$.

Question 6 - Speed and the MVT [2 pts]

A delivery truck travels 150 miles in 2.5 hours on a highway. Use the MVT to explain why its speedometer read exactly 60 mph at some time.

Question 7 - Extrema with an exponential [3 pts]



Graph of $f(x) = xe^{-x}$.

Find the absolute extrema of $f(x) = xe^{-x}$ on $[0, 5]$.

Question 8 - Justifying a maximum [2 pts]

A continuous function h on $[1, 6]$ has exactly one critical number, $x = 3$, with $h(1) = 4$, $h(3) = 9$ and $h(6) = 2$. State the absolute maximum and minimum and name the theorem that guarantees they exist.