

AP Calculus AB - Increasing, Decreasing and the First Derivative Test - Test

Common Core AP CALC AB 5.4, AP CALC AB 5.5, AP CALC AB 5.6 · maths-pdf.fr/en/

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

This test checks increasing and decreasing intervals, sign charts of the derivative, the First Derivative Test and absolute extrema (AP Calculus AB, 5.4, 5.5, 5.6). 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.

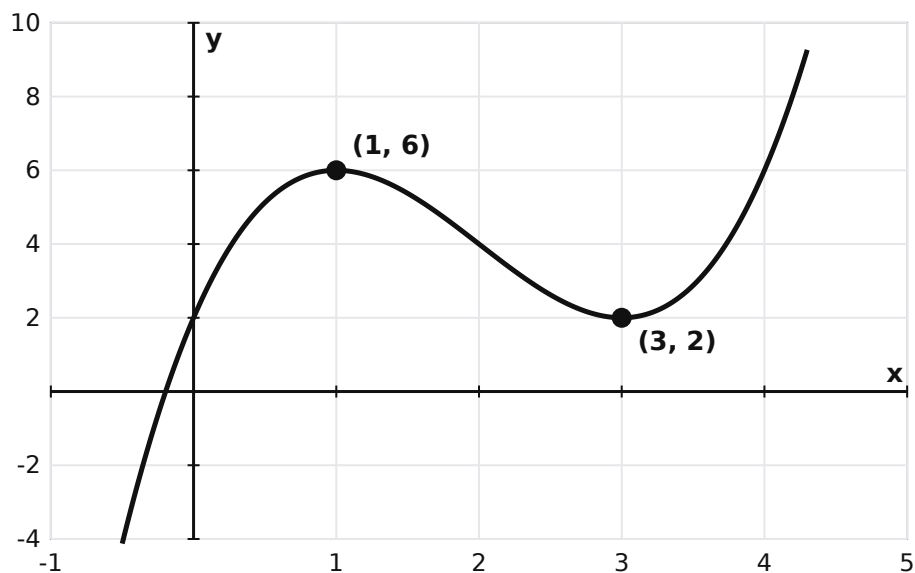
About this test

- Grade: AP Calculus AB
- Chapter: Increasing, Decreasing and the First Derivative Test
- Standards: AP CALC AB 5.4, AP CALC AB 5.5, AP CALC AB 5.6
- Time: 45 minutes
- Total: 20 points

Question 1 - Intervals of monotonicity [2 pts]

Find the intervals where $f(x) = xe^x$ is increasing and decreasing.

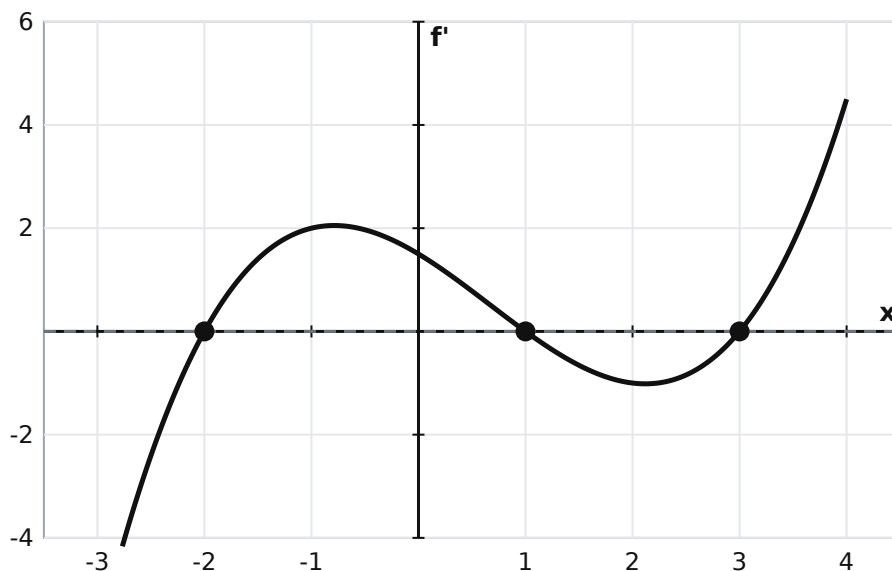
Question 2 - First derivative test [3 pts]



Graph of $f(x) = x^3 - 6x^2 + 9x + 2$.

Use a sign chart of f' to find the relative extrema of $f(x) = x^3 - 6x^2 + 9x + 2$.

Question 3 - Reading the derivative graph [2 pts]



The graph of f' (not f).

The graph shows the derivative f' of a function f , with zeros at -2 , 1 and 3 . (a) On which interval(s) is f increasing? (1 point) (b) At which x does f have a relative maximum? (1 point)

Question 4 - No sign change [3 pts]

Let $g'(x) = (x-1)^2(x+4)$. (a) Find the critical numbers. (1 point) (b) Make a sign chart. (1 point) (c) Classify each critical number. (1 point)

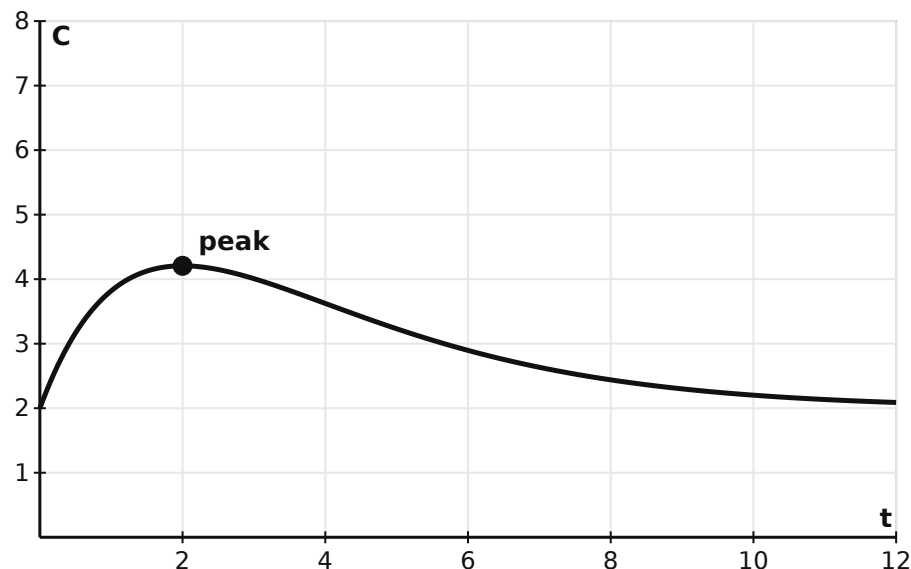
Question 5 - Absolute extrema [3 pts]

Find the absolute maximum and minimum of $f(x) = x^4 - 4x^3$ on $[-1, 4]$.

Question 6 - Justification [2 pts]

A function h has $h'(x) = \frac{x-2}{x^2+1}$. Does h have a relative maximum or minimum at $x = 2$? Justify.

Question 7 - Concentration over time [3 pts]



Concentration $C(t)$ over time.

The concentration of a chemical in a tank in mg/L is $C(t) = 2 + 3te^{-t/2}$ for $t \geq 0$ hours. (a) Find $C'(t)$. (1 point) (b) When is the concentration increasing or decreasing? (1 point) (c) Find the maximum concentration. (1 point)

Question 8 - Finding constants [2 pts]

The function $f(x) = x^3 + px^2 + qx$ has a relative maximum at $x = -1$ and a relative minimum at $x = 3$. Find p and q .