

AP Calculus AB - The Derivative as a Limit - Test

Common Core AP CALC AB 2.1, AP CALC AB 2.2, AP CALC AB 2.3, AP CALC AB 2.4 · maths-pdf.fr/en/

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

This test checks average and instantaneous rates of change, the limit definition of the derivative, tangent lines and differentiability (AP Calculus AB, 2.1, 2.2, 2.3, 2.4). 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: The Derivative as a Limit
- Standards: AP CALC AB 2.1, AP CALC AB 2.2, AP CALC AB 2.3, AP CALC AB 2.4
- Time: 45 minutes
- Total: 20 points

Question 1 - Average and instantaneous rate [2 pts]

Let $f(x) = x^2$. (a) Find the average rate of change on $[2, 5]$. (1 point) (b) Find the average rate on $[2, 2.01]$ and use it to estimate $f'(2)$. (1 point)

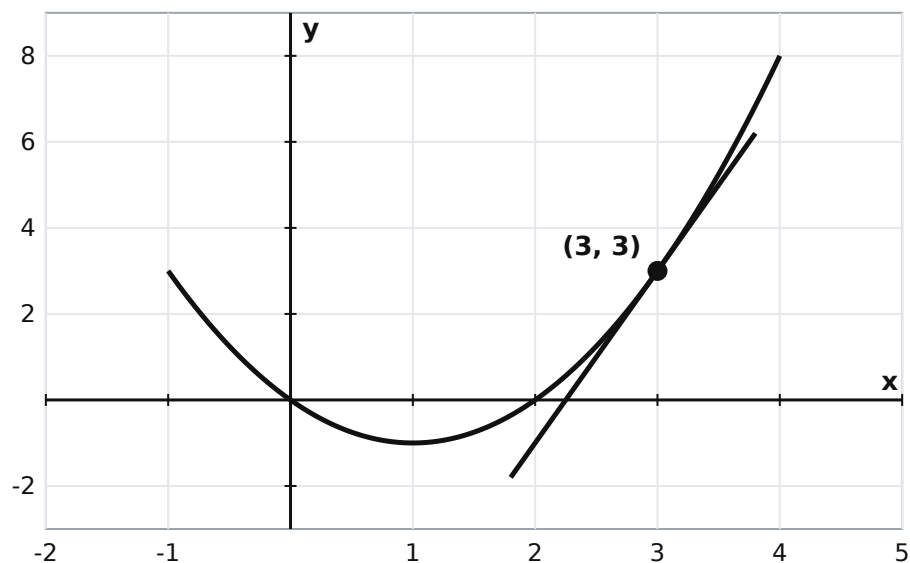
Question 2 - Limit definition, polynomial [3 pts]

Use the limit definition to find $f'(2)$ for $f(x) = x^2 - 3x$.

Question 3 - Limit definition, reciprocal [3 pts]

Use the limit definition to find $f'(3)$ for $f(x) = \frac{2}{x}$.

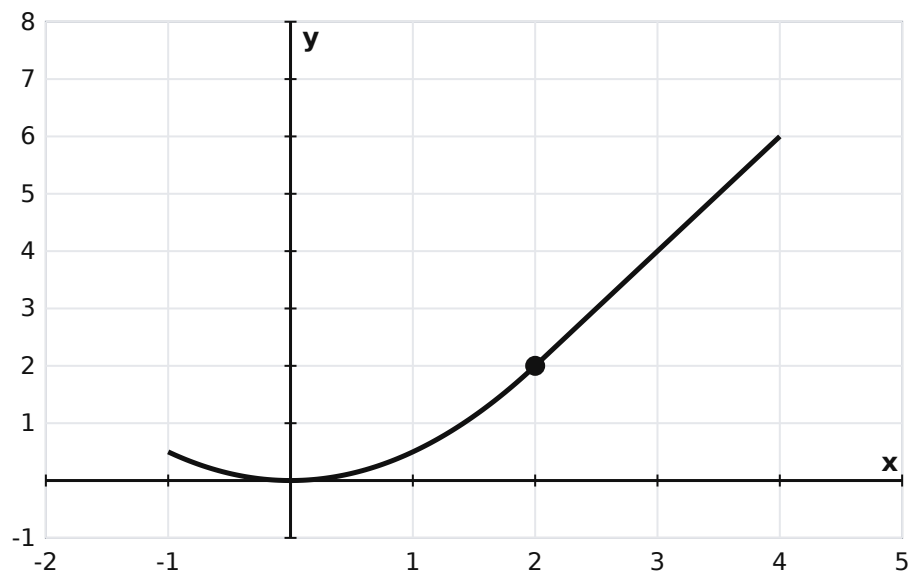
Question 4 - Tangent line [2 pts]



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

For $g(x) = x^2 - 2x$, use $g'(3) = 4$ to write the equation of the tangent line at $x = 3$.

Question 5 - Differentiability of a piecewise function [3 pts]



Graph of a piecewise function k .

Let $k(x) = \frac{x^2}{2}$ for $x \leq 2$ and $k(x) = 2x - 2$ for $x > 2$. (a) Is k continuous at $x = 2$? (1 point) (b) Compare the slopes on each side and decide whether k is differentiable at $x = 2$. (2 points)

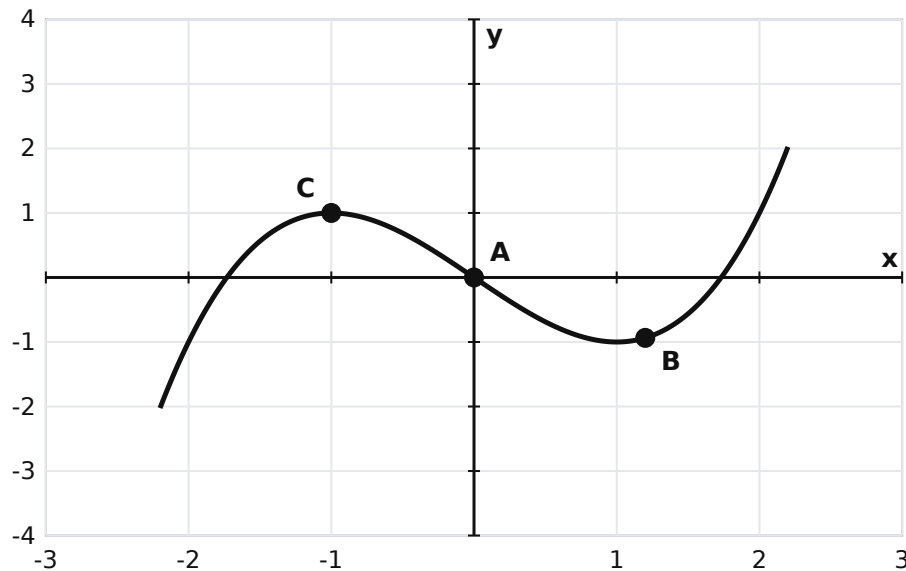
Question 6 - Recognizing a derivative [2 pts]

The limit $\lim_{h \rightarrow 0} \frac{(3+h)^4 - 81}{h}$ equals $f'(a)$ for some function f and number a . Identify f and a , then evaluate the limit.

Question 7 - Cost of a pizza oven [3 pts]

The profit in dollars for selling n pizzas in an hour is $P(n) = -n^2 + 30n$. (a) Find the average rate of change from $n = 10$ to $n = 12$. (1 point) (b) Use the limit definition to find $P'(10)$. (2 points)

Question 8 - Slopes on a graph [2 pts]



A curve with three marked points.

Using the graph, tell whether f' is positive, negative or zero at each point. (2 points) Point A is at $x = 0$, point B near $x = 1.2$, and point C at $x = -1$.