

AP Calculus AB · Definition of the Derivative and Basic Rules · Test

Common Core AP Calculus AB Unit 2 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This ap calculus derivative rules test checks definition of the derivative and basic rules in 45 minutes, with 9 questions for a total of 20 points.

This 45-minute test has 9 questions worth 20 points. Calculators are not needed. Show your work for every question, give exact answers, and include units where a question has a context.

Test information

- **Grade:** AP Calculus AB
- **Chapter:** Definition of the Derivative and Basic Rules
- **Common Core:** AP Calculus AB Unit 2
- **Time:** 45 minutes
- **Total:** 20 points (Question 1: 2 pts; Question 2: 3 pts; Question 3: 2 pts; Question 4: 2 pts; Question 5: 3 pts; Question 6: 2 pts; Question 7: 2 pts; Question 8: 2 pts; Question 9: 2 pts)

AP Calculus Derivative Rules Test: questions 1-5

Question 1: Limit definition (2 points)

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

Question 2: Basic rules (3 points)

Find the derivative of each function.

- $f(x) = 5x^4 - 2\sqrt{x} + 7$ (1 point)
- $g(x) = 3e^x - 4\sin x + 2\ln x$ (1 point)
- $h(x) = \frac{6}{x^2} + 3\cos x$ (1 point)

Question 3: Product rule (2 points)

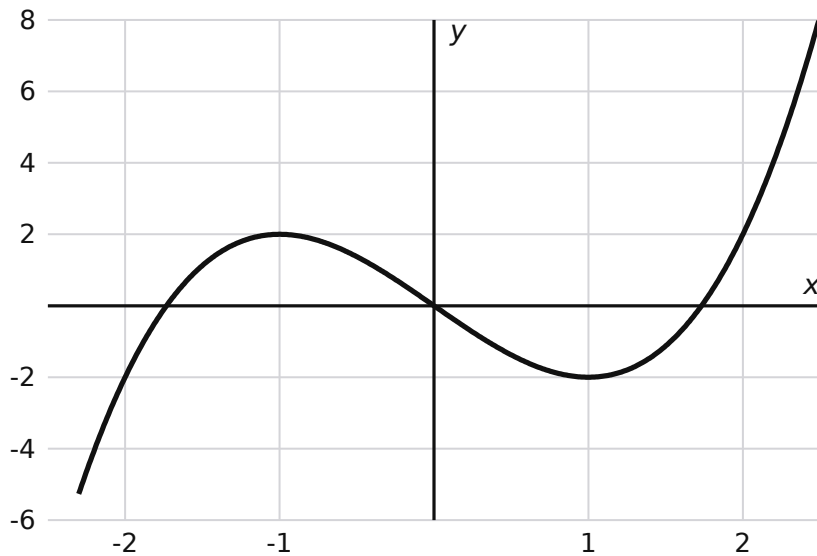
Let $f(x) = x^3 e^x$. Find $f'(x)$ and evaluate $f'(1)$.

Question 4: Quotient rule (2 points)

Let $g(x) = \frac{2x+1}{x^2+1}$. Find $g'(x)$ and evaluate $g'(0)$.

Question 5: Tangent lines to a cubic (3 points)

The graph of $f(x) = x^3 - 3x$ is shown.



Graph of f .

- Write an equation of the tangent line at $x = 2$. (1 point)
- Find every x where the tangent line is horizontal. (1 point)
- Find every x where the tangent line is parallel to $y = 6x$. (1 point)

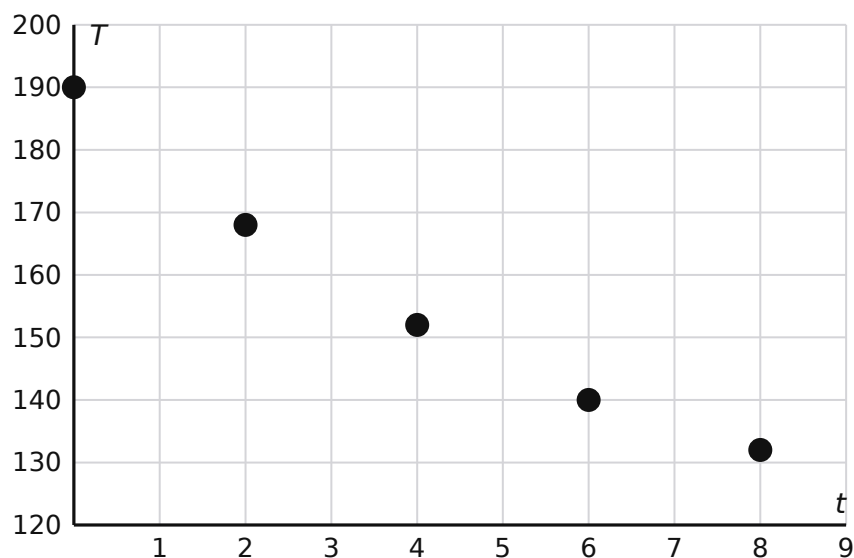
AP Calculus Derivative Rules Test: questions 6-9

Question 6: Differentiable piecewise function (2 points)

Let $f(x) = x^2 + 1$ when $x \leq 2$ and $f(x) = ax + b$ when $x > 2$. Find a and b so that f is differentiable at $x = 2$.

Question 7: Estimating rates from data (2 points)

The temperature T in $^{\circ}\text{F}$ of a cup of coffee is measured t minutes after it is poured.



Coffee temperature data.

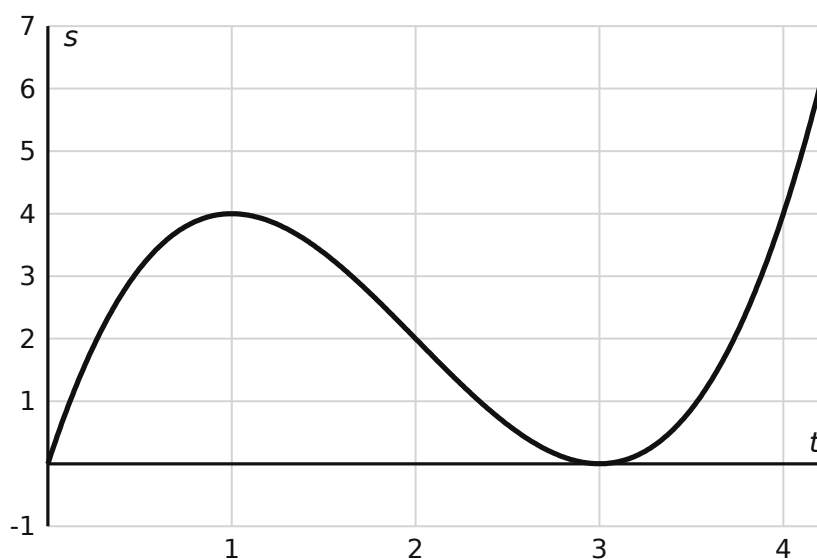
- Find the average rate of change of T on $[0, 4]$. Include units. (1 point)
- Estimate $T'(6)$ using the points at $t = 4$ and $t = 8$, and explain what it means. (1 point)

Question 8: Derivative with tangent (2 points)

Let $f(x) = x \tan x$. Find $f'(x)$ and evaluate $f'(\frac{\pi}{4})$.

Question 9: Motion along a line (2 points)

A particle moves along a line with position $s(t) = t^3 - 6t^2 + 9t$ feet, $t \geq 0$ seconds.



Position of the particle.

- Find the velocity $v(t) = s'(t)$. (1 point)
- Find every time the particle is at rest, and the position at each. (1 point)

How to use this ap calculus derivative rules test

Take this ap calculus derivative rules test without notes, then grade it with the test answer key out of 20 points.

