

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

Common Core AP Calculus AB Unit 2 · mathovore.fr

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

This ap calculus derivative rules quiz asks 10 multiple-choice questions on definition of the derivative and basic rules, and each answer comes with a short explanation.

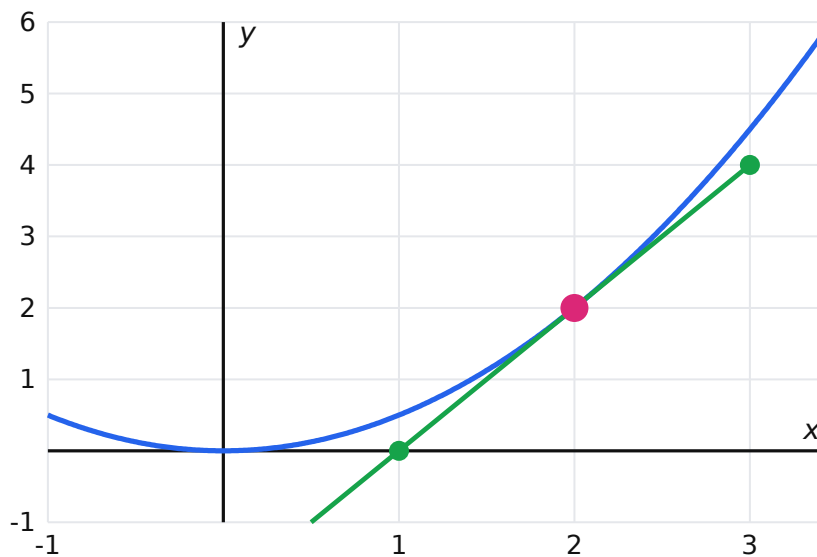
This 10-question multiple choice quiz checks the limit definition, differentiability, the power, product and quotient rules, and trig, exponential and logarithmic derivatives. Pick the one correct answer for each question, then read the explanation to learn from any miss.

AP Calculus ABCommon Core: AP Calculus AB Unit 2

Questions

Question 1

The graph of f is shown with a tangent line at $(2,2)$. What is $f'(2)$?



Graph for question 1.

- A. 1
- B. 4
- C. $\frac{1}{2}$
- D. 2

Question 2

Which expression defines $f'(x)$?

- A. $\lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{h}$
- B. $\lim_{h \rightarrow 0} \frac{f(x+h)+f(x)}{h}$
- C. $\lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{x+h}$
- D. $\lim_{h \rightarrow 0} \frac{f(x)-f(h)}{h}$

Question 3

Find $\frac{d}{dx}(4\sqrt{x})$.

- A. $\frac{1}{2\sqrt{x}}$
- B. $\frac{2}{\sqrt{x}}$
- C. $2\sqrt{x}$
- D. $\frac{4}{\sqrt{x}}$

Question 4

If $f(x) = x^2e^x$, what is $f'(1)$?

- A. $2e$
- B. e
- C. $3e$
- D. 3

Question 5

Find $\frac{d}{dx}\left(\frac{x}{x+2}\right)$.

- A. $\frac{2}{(x+2)^2}$
- B. $\frac{1}{(x+2)^2}$
- C. $\frac{2x+2}{(x+2)^2}$
- D. $\frac{1}{2}$

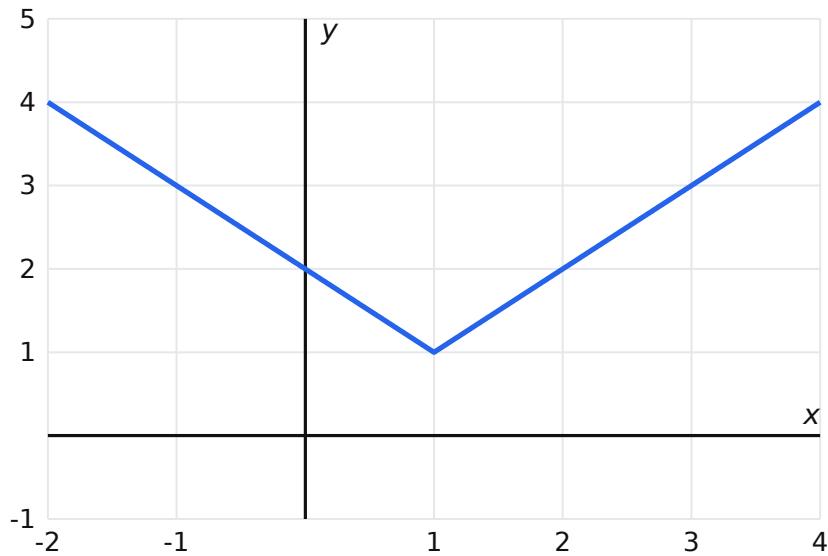
Question 6

If $f(x) = 3\cos x$, what is $f'\left(\frac{\pi}{6}\right)$?

- A. $-\frac{3}{2}$
- B. $\frac{3}{2}$
- C. $-\frac{3\sqrt{3}}{2}$
- D. $\frac{3\sqrt{3}}{2}$

Question 7

The graph of f is shown. At which x -value is f not differentiable?



Graph for question 7.

- A. $x=0$
- B. $x=2$
- C. f is differentiable everywhere
- D. $x=1$

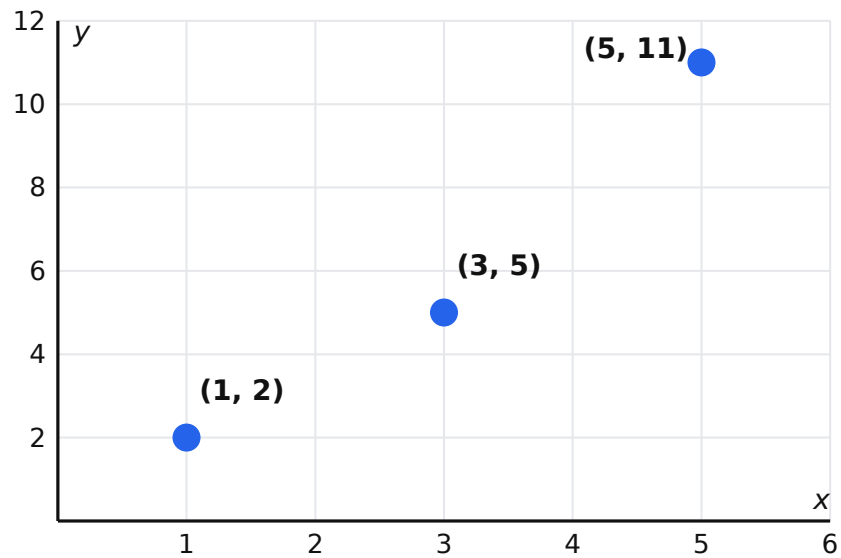
Question 8

Differentiate $y = \csc x$.

- A. $\csc x \cot x$
- B. $-\csc^2 x$
- C. $-\csc x \cot x$
- D. $-\sec x \tan x$

Question 9

Three points on the graph of a smooth function f are shown. Which value best estimates $f'(3)$?



Graph for question 9.

- A. 1.5
- B. 2.25
- C. 3
- D. 4.5

Question 10

What is an equation of the tangent line to $y = e^{2x}$ at $x = 0$?

- A. $y = x + 1$
- B. $y = 2x$
- C. $y = 2x - 1$
- D. $y = 2x + 1$

Answer key

1. **D** - The tangent passes through (1,0) and (3,4), so its slope is $\frac{4-0}{3-1}=2$. Using $\frac{2}{2}=1$, the slope from the origin, is a common mistake.
2. **A** - The derivative is the limit of the slope of a secant line: change in output over change in input, which is h .
3. **B** - $4x^{1/2}$ has derivative $4 \cdot \frac{1}{2}x^{-1/2} = \frac{2}{\sqrt{x}}$. Forgetting the constant 4 gives $\frac{1}{2\sqrt{x}}$.
4. **C** - Product rule: $f'(x) = 2xe^x + x^2e^x$, so $f'(1) = 2e + e = 3e$. Differentiating each factor and multiplying gives $2e$, a classic error.
5. **A** - Quotient rule: $\frac{1(x+2)-x(1)}{(x+2)^2} = \frac{2}{(x+2)^2}$. Writing the numerator as $f'g + fg'$ gives the wrong $\frac{2x+2}{(x+2)^2}$.
6. **A** - $f'(x) = -3\sin x$ and $\sin \frac{\pi}{6} = \frac{1}{2}$, so the value is $-\frac{3}{2}$. The derivative of cosine carries a negative sign.
7. **D** - The graph has a corner at (1,1): the slope is -1 on the left and 1 on the right. The function is continuous there but has no derivative.
8. **C** - The derivative of cosecant is $-\csc x \cot x$. Dropping the minus sign gives the wrong sign, and $-\csc^2 x$ is the derivative of cotangent.
9. **B** - Use the points on either side of $x=3$: $\frac{11-2}{5-1} = 2.25$. The left slope is 1.5 and the right slope is 3 , each using only one side.
10. **D** - $y' = 2e^{2x}$, so the slope at 0 is 2 and the point is $(0,1)$. That gives $y-1 = 2(x-0)$, or $y = 2x+1$. The line $y = x+1$ forgets the chain rule factor.

How does this quiz work?

Read each question, choose one answer among A, B, C and D, then check it: a short explanation appears after every answer. Your score out of 10 is shown at the end, and you can restart the quiz as often as you like.

What should you review before the quiz?

Reread the key facts of the lesson and the worked example. If a question is hard, go back to the matching part of the lesson, then try the quiz again. Write your work on scrap paper: most mistakes come from skipping a step, not from the idea itself.

Remember:

- AP Calculus AB Unit 2: $f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}$ is the slope of the tangent line at $x=a$.
- Average rate of change on $[a,b]$ is $\frac{f(b)-f(a)}{b-a}$, the slope of a secant line.
- Power rule: $\frac{d}{dx}x^n = nx^{n-1}$. Product rule: $(fg)' = f'g + fg'$. Quotient rule: $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$.

- A function is not differentiable at a corner, cusp, vertical tangent or discontinuity; differentiable implies continuous.
- $\frac{d}{dx}\sin x = \cos x$, $\frac{d}{dx}\cos x = -\sin x$, $\frac{d}{dx}e^x = e^x$, $\frac{d}{dx}\ln x = \frac{1}{x}$.

How to use this ap calculus derivative rules quiz

Retake this ap calculus derivative rules quiz until every answer is right, then move on to the worksheet and the test.

