

AP Calculus AB · Chain Rule, Implicit Differentiation and Inverse Functions · Quiz

Common Core AP Calculus AB Unit 3 · mathovore.fr

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

This ap calculus chain implicit quiz asks 10 multiple-choice questions on chain rule, implicit differentiation and inverse functions, and each answer comes with a short explanation.

Ten multiple-choice questions on the chain rule, implicit differentiation, inverse functions and second derivatives. Pick one answer for each, then read the explanation to see the common mistake.

AP Calculus ABCommon Core: AP Calculus AB Unit 3

Questions

Question 1

Find $\frac{d}{dx}(5x-2)^4$.

- A. $20(5x-2)^3$
- B. $4(5x-2)^3$
- C. $5(5x-2)^3$
- D. $20(5x-2)^4$

Question 2

Find $\frac{d}{dx}\sin(x^2)$.

- A. $\cos(x^2)$
- B. $2x\cos x$
- C. $2x\cos(x^2)$
- D. $-2x\sin(x^2)$

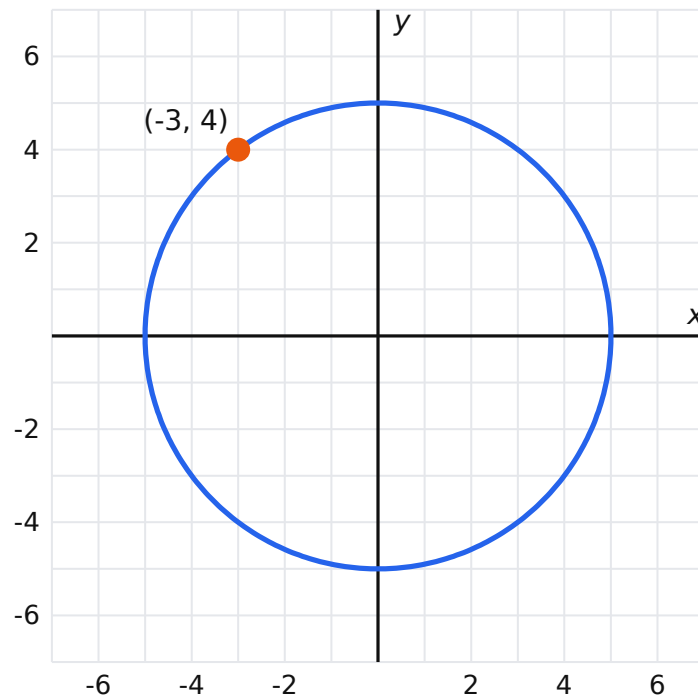
Question 3

Find $\frac{d}{dx}e^{3x^2}$.

- A. e^{3x^2}
- B. $6x e^{3x^2}$
- C. $6x e^{3x}$
- D. $3x^2 e^{3x^2}$

Question 4

Use the figure to find the slope of the circle $x^2 + y^2 = 25$ at $(-3, 4)$.



Circle of radius 5; the point $(-3, 4)$ lies on the upper left part.

- A. $\frac{3}{4}$
- B. $-\frac{3}{4}$
- C. $\frac{4}{3}$
- D. $-\frac{4}{3}$

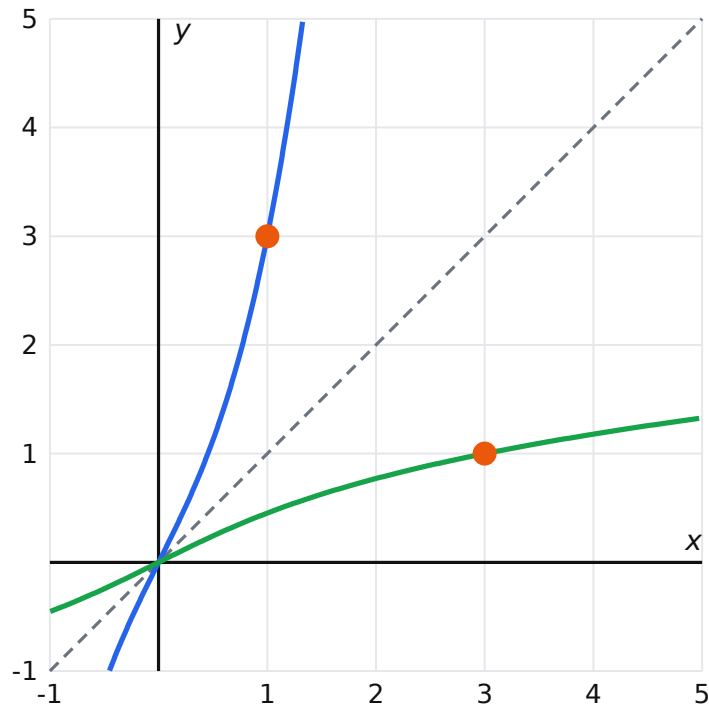
Question 5

Differentiating $x^2 + y^3 = 10$ implicitly with respect to x gives $\frac{dy}{dx}$ equal to what?

- A. $\frac{2x}{3y^2}$
- B. $-\frac{2x}{3y^2}$
- C. $-\frac{2x}{3y}$
- D. $-\frac{x}{y^2}$

Question 6

Let $f(x) = x^3 + 2x$, with graph and inverse shown. What is $(f^{-1})'(3)$?



Blue: f . Green: its reflection.

- A. 5
- B. $\frac{1}{29}$
- C. $\frac{1}{33}$
- D. $\frac{1}{55}$

Question 7

Find $\frac{d}{dx} \tan^{-1}(2x)$.

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

Question 8

Let $f(x) = x^5 - 2x^3$. What is $f''(1)$?

- A. -1
- B. 48
- C. 20
- D. 8

Question 9

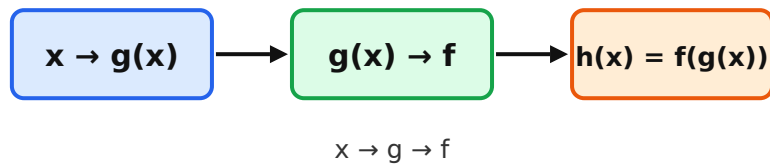
Find $\frac{d^2}{dx^2} \cos(5x)$.

- A. $-5\cos(5x)$

- B. $25\cos(5x)$
- C. $-25\sin(5x)$
- D. $-25\cos(5x)$

Question 10

Let $h(x) = f(g(x))$ with $g(2) = 5$, $g'(2) = 3$, $f'(2) = 4$ and $f'(5) = -2$. What is $h'(2)$?



- A. -6
- B. 12
- C. 6
- D. 1

Answer key

1. **A** - Power rule gives $4(5x-2)^3$, then multiply by the inner derivative 5. Forgetting that factor gives the first wrong choice.
2. **C** - The outer derivative is cosine of the same inside, times the inner derivative $2x$.
3. **B** - Exponentials keep their exponent; multiply by $\frac{d}{dx}(3x^2) = 6x$.
4. **A** - $\frac{dy}{dx} = -\frac{x}{y} = -\frac{-3}{4} = \frac{3}{4}$. The slope is positive on the upper left because the curve rises toward the top.
5. **B** - $2x + 3y^2 \frac{dy}{dx} = 0$ and then divide. Dropping the minus sign is the usual slip.
6. **D** - $f(1) = 3$ and $f'(1) = 5$, so the inverse slope is $\frac{1}{5}$. Using $f'(3) = 29$ is a common mistake.
7. **C** - Use $\frac{1}{1+u^2}$ with $u = 2x$, then multiply by 2.
8. **D** - $f''(x) = 20x^3 - 12x$, so $f''(1) = 8$. The value -1 is only the first derivative, and 48 is the third.
9. **D** - First derivative $-5\sin(5x)$; second derivative $-25\cos(5x)$. Each differentiation adds a factor of 5.
10. **A** - $h'(2) = f'(g(2))$ $g'(2) = f'(5) \cdot 3 = -6$. The mistake $f'(2) \cdot g'(2) = 12$ evaluates f' at the wrong input.

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:

- Chain rule: outer derivative evaluated at the inside, times the inner derivative.
- Implicit differentiation: every y-term gets a factor of dy/dx from the chain rule.
- Inverse functions: if $f(a) = b$, then $(f^{-1})'(b) = 1/f'(a)$.
- The second derivative f'' is the derivative of f' and measures how the slope changes.

How to use this ap calculus chain implicit quiz

Retake this ap calculus chain implicit quiz until every answer is right, then move on to the

worksheet and the test.

