

AP Calculus AB · Integration and Accumulation of Change · Quiz

Common Core AP Calculus AB Unit 6 · mathovore.fr

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

This ap calculus integration quiz asks 10 multiple-choice questions on integration and accumulation of change, and each answer comes with a short explanation.

Ten multiple-choice questions check the main ideas of AP Calculus AB Unit 6: antiderivatives, Riemann sums, properties of definite integrals, the Fundamental Theorem of Calculus, u-substitution and accumulation. Choose the single best answer for each question.

AP Calculus ABCommon Core: AP Calculus AB Unit 6

Questions

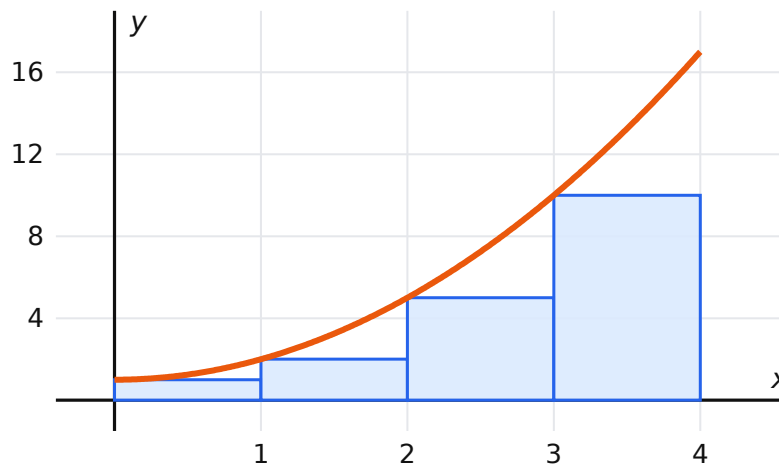
Question 1

Find $\int (4x^3 - 2x) \, dx$.

- A. $12x^2 - 2 + C$
- B. $x^4 - 2x^2 + C$
- C. $4x^4 - 2x^2 + C$
- D. $x^4 - x^2 + C$

Question 2

The rectangles shown are used to estimate $\int_0^4 (x^2 + 1) \, dx$. What is the value of this left Riemann sum?



- A. 18
- B. 34
- C. 25
- D. 26

Question 3

A continuous function f is decreasing on $[0, 6]$. How does a right Riemann sum with 3 equal subintervals compare with $\int_0^6 f(x) dx$?

- A. It is an overestimate.
- B. It is an underestimate.
- C. It is exactly equal.
- D. It cannot be compared.

Question 4

If $\int_2^5 f(x) dx = 8$, what is $\int_5^2 3f(x) dx$?

- A. -24
- B. 24
- C. -8
- D. $-\frac{8}{3}$

Question 5

Find $\frac{d}{dx} \int_0^{x^2} e^t dt$.

- A. e^{x^2}
- B. $e^{x^2}-1$
- C. $2xe^{x^2}$
- D. $2xe^x$

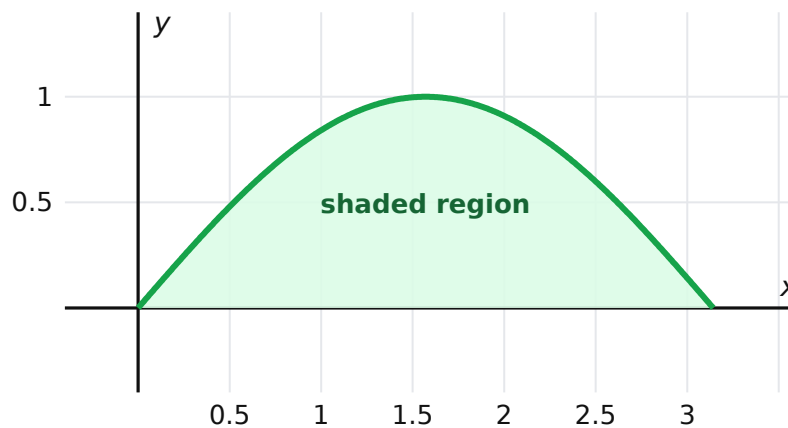
Question 6

Find $\int 2x \cos(x^2) dx$.

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

Question 7

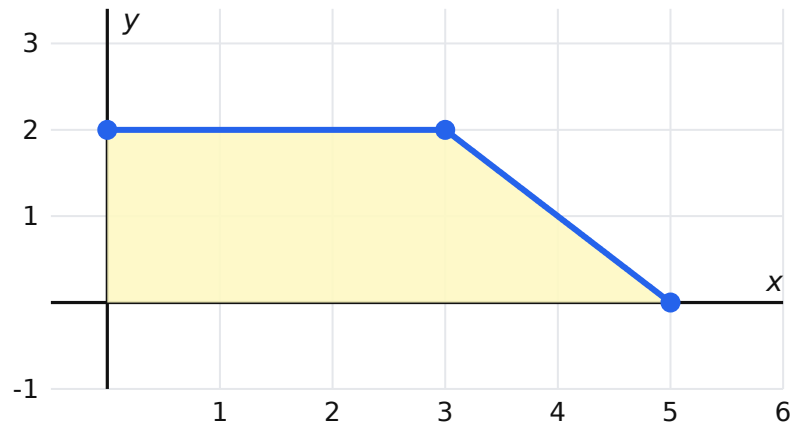
The region under one arch of $y = \sin x$ is shown. What is $\int_0^\pi \sin x \, dx$?



- A. 0
- B. -2
- C. 1
- D. 2

Question 8

The graph of f is 2 on $[0,3]$ and then drops along a line to 0 at $x=5$. What is $\int_0^5 f(x) \, dx$?



- A. 8
- B. 6
- C. 10
- D. 12

Question 9

Evaluate $\int_0^1 2xe^{x^2} dx$.

- A. e
- B. $2(e-1)$
- C. $e-1$
- D. $1-e$

Question 10

Water flows into a pool at the rate $3t^2$ gallons per hour. How many gallons flow in between $t=1$ and $t=3$?

- A. 24
- B. 26
- C. 27
- D. 18

Answer key

1. **D** - Each power goes up by one and is divided by the new exponent: $\int 4x^3 dx = x^4$ and $\int 2x dx = x^2$. The first wrong choice is a derivative, not an antiderivative.
2. **A** - Heights at $x=0,1,2,3$ are 1,2,5,10, and each width is 1, so the sum is 18. The value 34 is the right sum, 25 the midpoint sum and 26 the trapezoidal sum.
3. **B** - For a decreasing function the right endpoint is the lowest point of each subinterval, so every rectangle fits under the curve and the sum is too small.
4. **A** - Reversing the limits changes the sign and the constant factor 3 multiplies: $3 \cdot (-8) = -24$. Forgetting either step gives 24 or -8 .
5. **C** - Substitute the upper limit into the integrand and multiply by its derivative: $e^{x^2} \cdot 2x$. Omitting the chain-rule factor $2x$ is the common slip.
6. **B** - With $u = x^2$ and $du = 2x dx$, the integral is $\int \cos u du = \sin u + C$. The antiderivative of cosine is sine, not negative sine.
7. **D** - $[-\cos x]_0^\pi = 1 - (-1) = 2$. Using $\sin x$ as the antiderivative would give 0, and a sign slip gives -2 .
8. **A** - The rectangle has area $2 \cdot 3 = 6$ and the triangle has area $\frac{1}{2} \cdot 2 \cdot 2 = 2$, so the total is 8. Using 6 leaves out the triangle.
9. **C** - Let $u = x^2$, $du = 2x dx$, limits 0 to 1: $\int_0^1 e^u du = e - 1$. The extra factor 2 in the third choice comes from ignoring that $2x dx$ is already du .
10. **B** - The net change is $\int_1^3 3t^2 dt = [t^3]_1^3 = 27 - 1 = 26$. Subtracting the two rates, $27 - 3 = 24$, confuses a rate with an accumulated amount.

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 6: Riemann sums, definite integrals, the Fundamental Theorem of Calculus, and antiderivative techniques.
- Left, right, midpoint and trapezoidal sums estimate $\int_a^b f dx$; for $f(x) = x^2 + 1$ on $[0, 4]$ with $n = 4$ they give 18, 34, 25 and 26.
- FTC Part 1: $\frac{d}{dx} \int_a^x f(t) dt = f(x)$. FTC Part 2: $\int_a^b f dx = F(b) - F(a)$.

- In u-substitution, change the limits of integration along with the variable.

How to use this ap calculus integration quiz

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

