

AP Calculus AB · Applications of Integration · Quiz

Common Core AP Calculus AB Unit 8 · mathovore.fr

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

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

Ten multiple-choice questions check average value, motion, area between curves, volumes and accumulation. Pick one answer for each question, then read the explanation to see the typical mistake behind each wrong choice.

AP Calculus ABCommon Core: AP Calculus AB Unit 8

Questions

Question 1

What is the average value of $f(x) = 6x$ on $[2, 5]$?

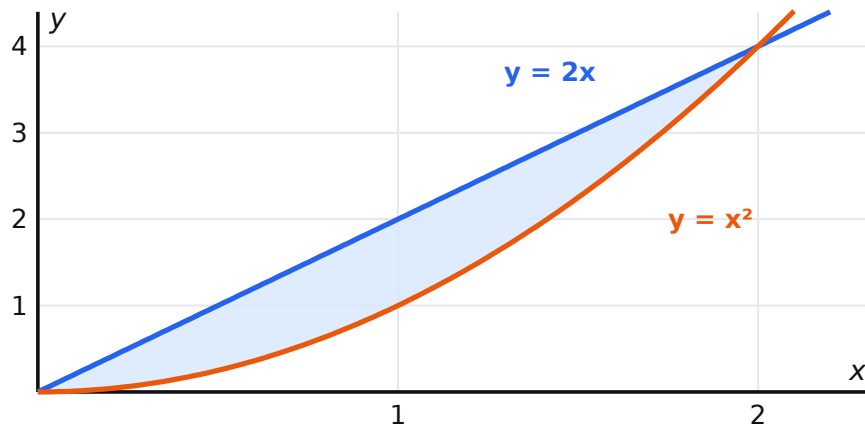
- A. 63
- B. 30
- C. 21
- D. 12

Question 2

A particle has velocity $v(t) = 2t - 6$ for $0 \leq t \leq 6$. What is the total distance traveled?

- A. 0
- B. 36
- C. 18
- D. 9

Question 3



The region.

What is the area of the shaded region between $y = 2x$ and $y = x^2$?

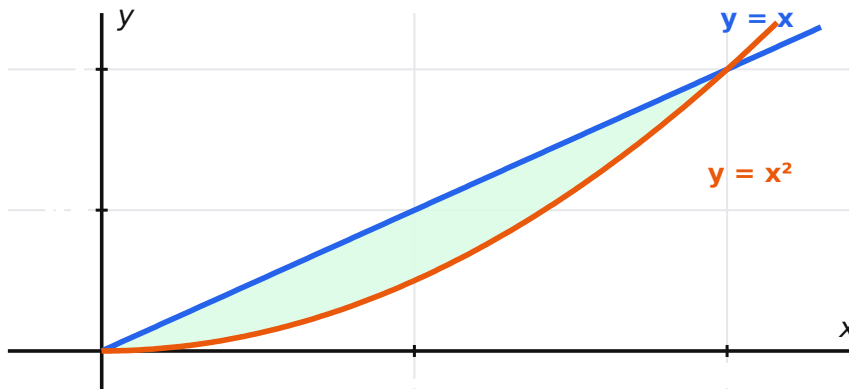
- A. $\frac{4}{3}$
- B. $\frac{8}{3}$
- C. 2
- D. $\frac{4}{3}$

Question 4

The area under the parabola $y = x^2$ between $x = 0$ and $x = 2$ spins around the x -axis. What is the volume of the solid?

- A. $\frac{32\pi}{5}$
- B. $\frac{8\pi}{3}$
- C. $\frac{16\pi}{5}$
- D. 32π

Question 5



The region.

This region is revolved about the x -axis. Which integral gives the volume?

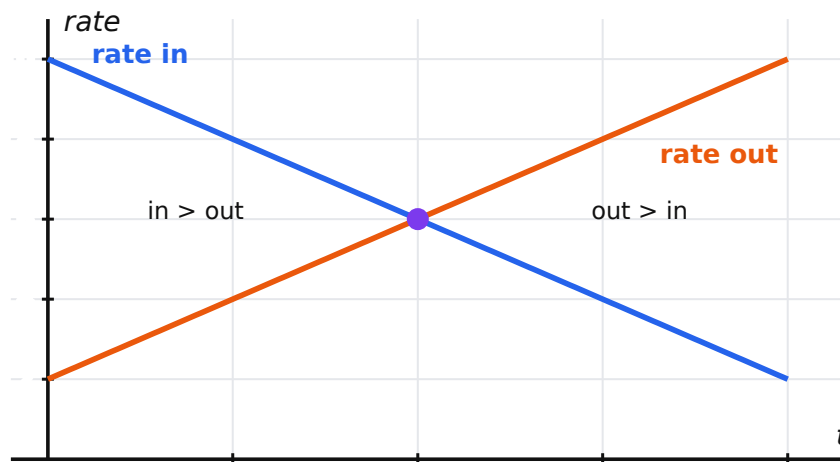
- A. $\pi \int_0^1 (x-x^2)^2 dx$
- B. $\pi \int_0^1 (x-x^2) dx$
- C. $\pi \int_0^1 (x^2-x^4) dx$
- D. $\int_0^1 (x^2-x^4) dx$

Question 6

The base of a solid is the region on $[0,2]$ under the line $y=x$ and above the x -axis. Cross sections perpendicular to the x -axis are squares. What is the volume?

- A. $\frac{4}{3}$
- B. $\frac{1}{3}$
- C. 2
- D. 4

Question 7



Amount increases while the rate in exceeds the rate out, and decreases afterward.

The graph shows the rate in $10-t$ and the rate out $2+t$ for the amount in a tank. At which time on $0 \leq t \leq 8$ is the amount greatest?

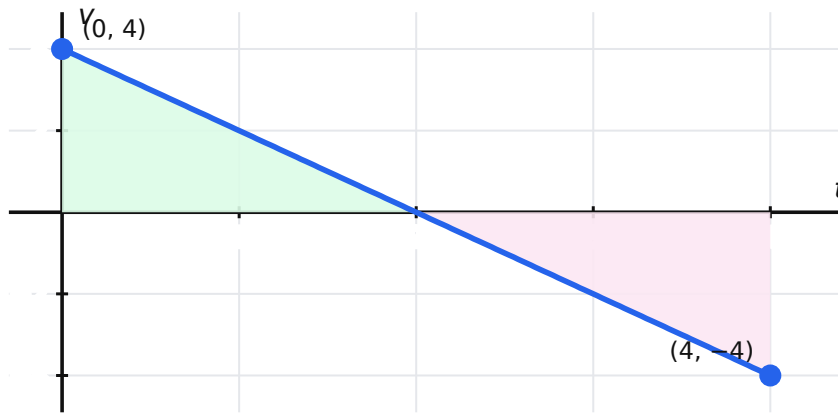
- A. $t=4$
- B. $t=0$
- C. $t=6$
- D. $t=8$

Question 8

What is the area of the region bounded by $x=y^2$ and $x=4$?

- A. $\frac{16}{3}$
- B. $\frac{32}{3}$
- C. 16
- D. $\frac{64}{3}$

Question 9



Velocity of a particle for $0 \leq t \leq 4$.

The graph shows the velocity of a particle for $0 \leq t \leq 4$. What is the total distance traveled?

- A. 0
- B. 16
- C. 4
- D. 8

Question 10

Water in a tank is $A(0) = 30$ gallons and $A'(t) = 6 - 2t$ gallons per minute. What is $A(4)$?

- A. 38
- B. 8
- C. 22
- D. 36

Answer key

1. **C** - $\int_2^5 6x \, dx = 3(25-4) = 63$, and dividing by $5-2=3$ gives 21. The value 63 forgets to divide by the interval length.
2. **C** - The displacement is 0, but the particle moves 9 units backward and 9 forward, so the distance is 18. Choosing 0 confuses displacement with distance.
3. **D** - $\int_0^2 (2x-x^2) \, dx = 4 - \frac{8}{3} = \frac{4}{3}$. Choosing 4 integrates only the top curve.
4. **A** - $V = \pi \int_0^2 (x^2)^2 \, dx = \pi \int_0^2 x^4 \, dx = \frac{32\pi}{5}$. The value $\frac{8\pi}{3}$ forgets to square the radius.
5. **C** - A washer has area $\pi(R^2-r^2)$ with $R=x$ and $r=x^2$. Squaring the difference is the most common mistake.
6. **B** - The side is x , so $V = \int_0^2 x^2 \, dx = \frac{8}{3}$. The value 4 integrates the side instead of the area.
7. **A** - The amount rises while the rate in exceeds the rate out, which happens until the lines cross at $t=4$. It falls after that.
8. **B** - $\int_{-2}^2 (4-y^2) \, dy = 16 - \frac{16}{3} = \frac{32}{3}$. The value $\frac{16}{3}$ uses only the half with $y \geq 0$.
9. **D** - The two triangles each have area $\frac{1}{2} \cdot 2 \cdot 4 = 4$. The displacement is 0, but the distance is $4+4=8$.
10. **A** - $\int_0^4 (6-2t) \, dt = 24-16=8$, so $A(4)=30+8=38$. Choosing 8 forgets the initial 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:

- Average value: $\frac{1}{b-a} \int_a^b f(x) \, dx$.
- Area between curves: integrate top minus bottom, or right minus left.
- Volume with cross sections: $\int A(x) \, dx$; washers: $\pi \int (R^2-r^2) \, dx$.
- Net change: $A(b) = A(a) + \int_a^b A'(t) \, dt$.

How to use this ap calculus applications integration quiz

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

