MATHEMATICS · GRADES 10-12

Area under a curve

Difficulty level: Advanced

Mathematics: Grades 10-12

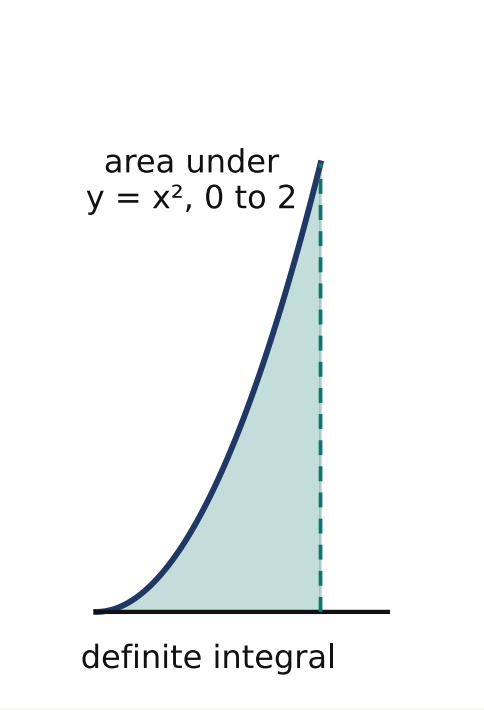
This document was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

© 2026 Brett Robbins. All Rights Reserved.

Overview of the concept

This is how you work out a total from a graph. The total distance travelled from a speed graph, or the total water used from a flow graph, is the area underneath the curve. It is how engineers and scientists turn a picture of how fast something was changing into the total amount that actually happened.



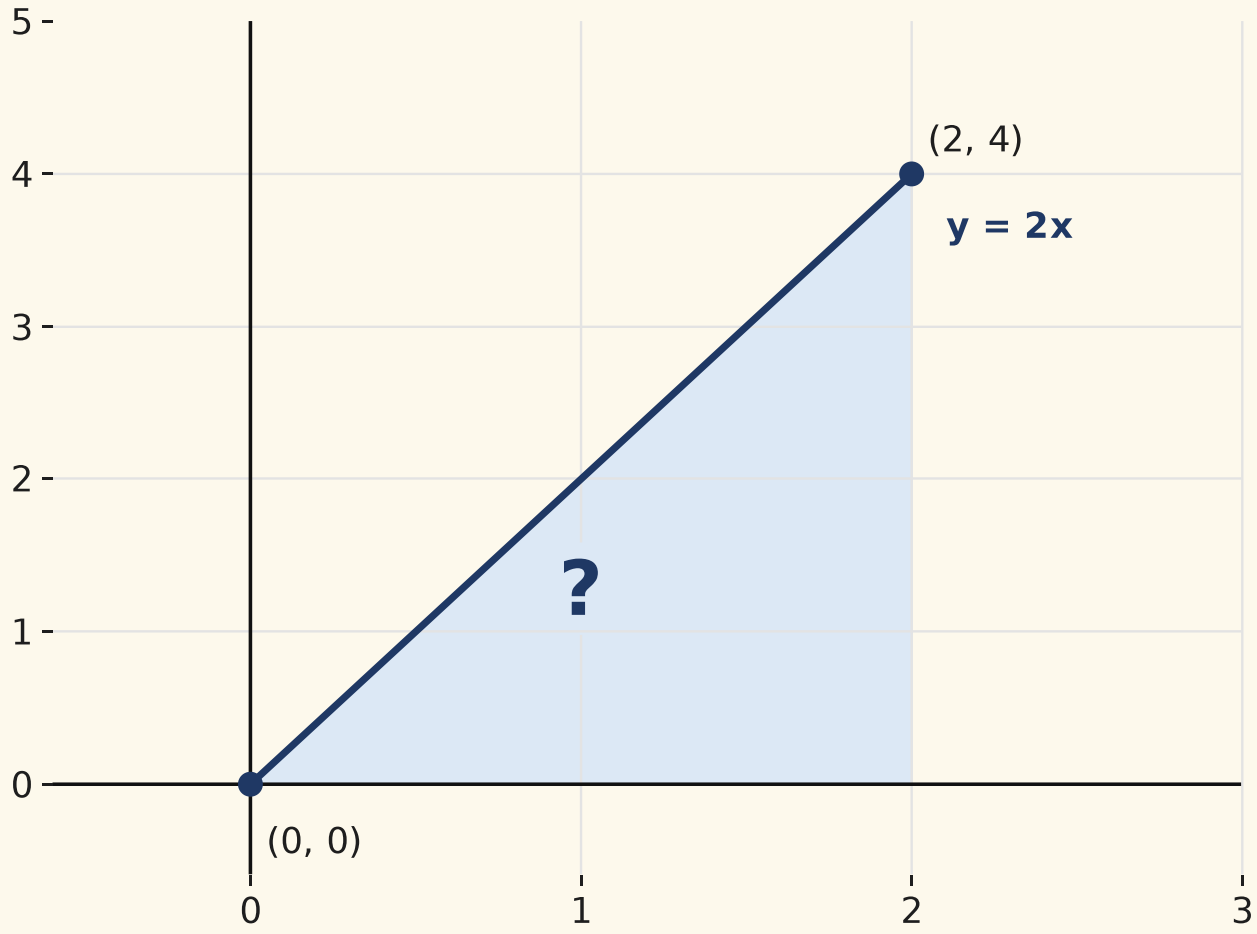


© 2026 Brett Robbins. All Rights Reserved.

Worked examples

EXAMPLE 1

Q Find the area under $y = 2x$ from 0 to 2.



SOLUTION

The function is non-negative on this interval, which means it never drops below zero, so the area under it is the integral.

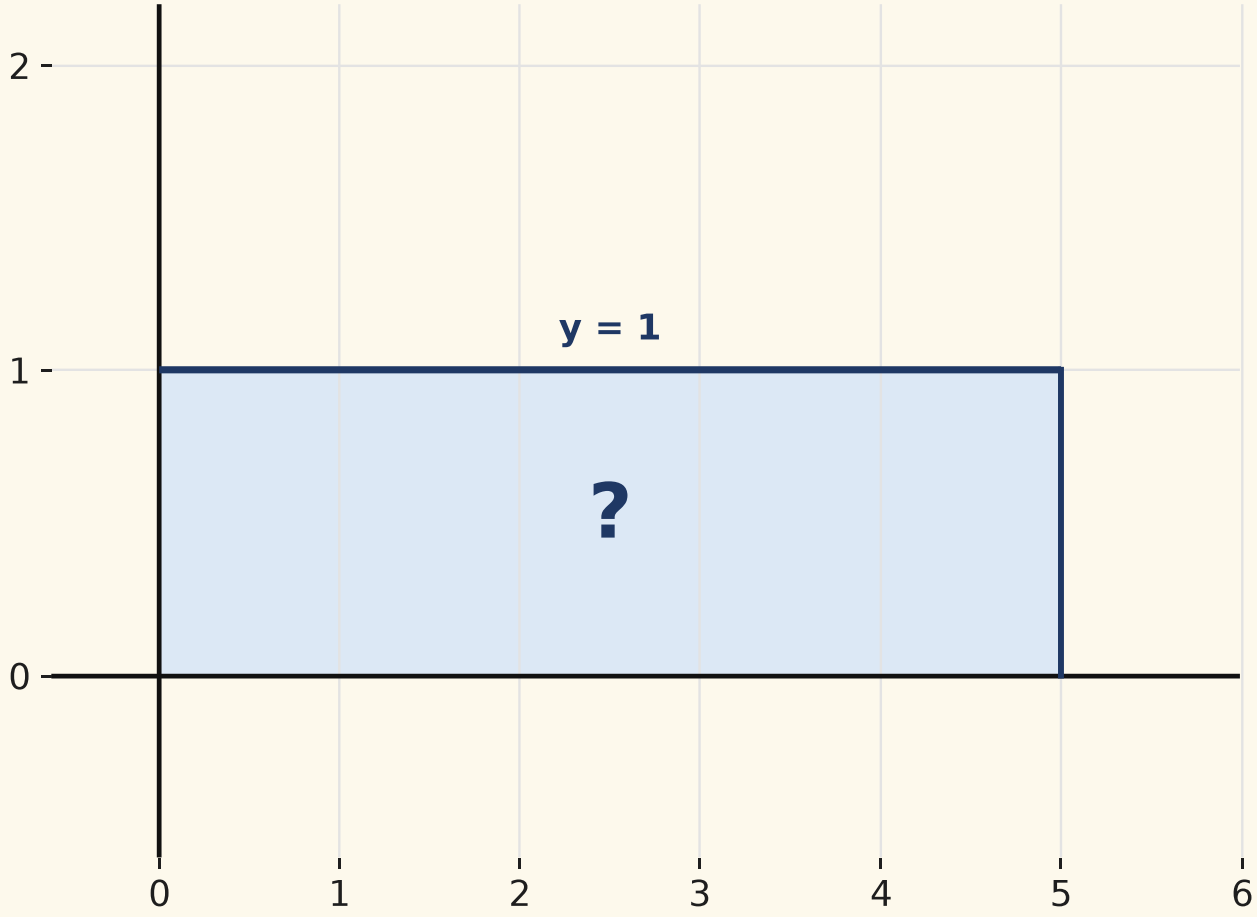
The antiderivative of $2x$ is x^2. Put in the two ends, 2 and 0: $2^2 - 0^2 = 4 - 0 = 4$

Area = 4 units^2

© 2026 Brett Robbins. All Rights Reserved.

EXAMPLE 2

Q Find the area under y = 1 from 0 to 5.



SOLUTION

The region is a rectangle: $5 \times 1 = 5$

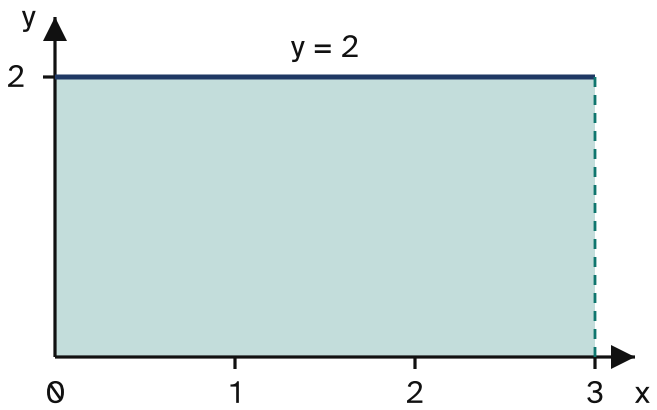
Integral of 1 from 0 to 5 is 5.

Area = 5 units^2

© 2026 Brett Robbins. All Rights Reserved.

Practice questions

1 What is the area under $y = 2$ from $x = 0$ to $x = 3$?



Understand It with Pulse | Flag a mistake

2 What is the area under $y = x$ from 0 to 2?

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

3 What is the area under $y = 3x^2$ from $x = 0$ to $x = 1$?

Understand It with Pulse | Flag a mistake

4 What is the value of the integral of $y = -2$ from 0 to 4?

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

5

When does the integral of a function give the area under its graph directly?

A When the function is non-negative on the interval

B When the function is negative on the interval

C When the function is zero on the interval

D When the function is decreasing on the interval

Understand It with Pulse | Flag a mistake

6

What is the area under $y = x^2$ from $x = 0$ to $x = 3$?

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

7 What is the area under $y = x + 1$ from 0 to 2?

Understand It with Pulse | Flag a mistake

8 What is the area under $y = 2x$ from 1 to 3?

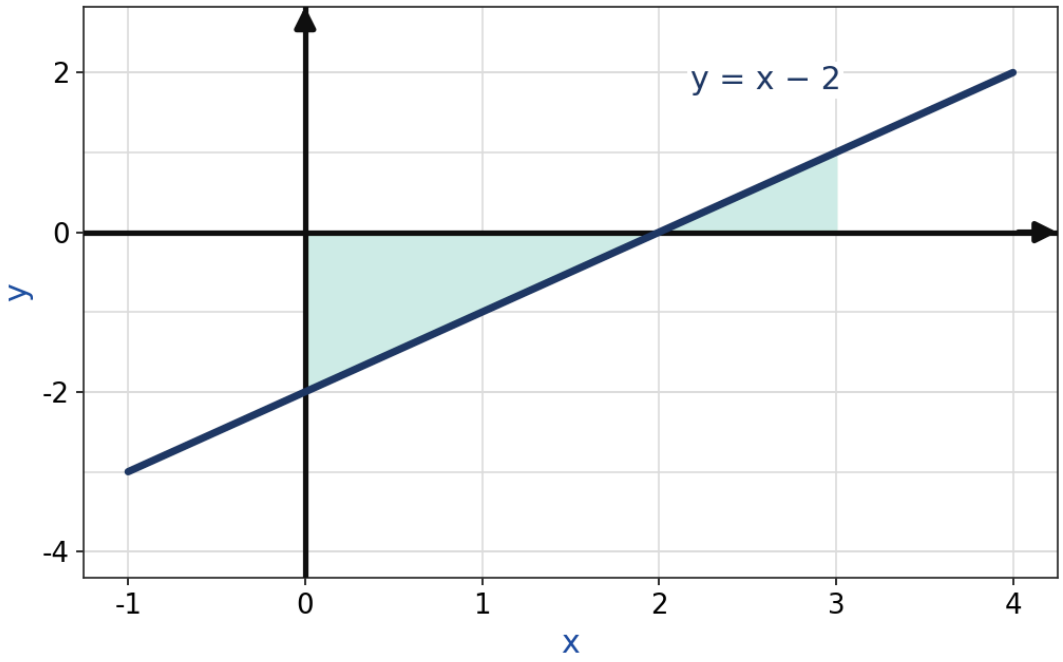
Understand It with Pulse | Flag a mistake

9 The area under $y = 2$ from 0 to 3 is 6. If the height doubles to $y = 4$, what is the new area?

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

10 **A graph dips below the x-axis. What must you do to get the true area from the integral?**



- **A** Take the absolute value
- **B** Ignore the part below the x-axis
- **C** Double the integral
- **D** Change the limits to 0 and 1

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

ANSWER KEY

1. 6

2. 2

3. 1

4. -8

5. When the function is non-negative on the interval

6. 9

7. 4

8. 8

9. 12

10. Take the absolute value

© 2026 Brett Robbins. All Rights Reserved.